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Investigating an Extended Theory of Planned Behavior Model in the Exercise Domain: Relationships with Personality and Demographic Characteristics

By

Ryan E. Rhodes

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Abstract

This dissertation examines extended conceptions within the Theory of Planned Behavior (TPB) proper (purpose 1), and the relationships of the TPB with personality (purpose 2 and purpose 3), and demographic characteristics (purpose 4) using structural equation modeling. The research questions were examined with distinct samples of approximately 300 undergraduate students in a two-week prospective design and 300 cancer survivors using a cross-sectional design. Purpose 1 was to investigate components of affective and instrumental attitude, injunctive and descriptive norm, social support, and self-efficacy and perceived volitional control as predictors of exercise intention and behavior. These TPB components were examined as specific concepts and compared to a common overall scale. Results suggested different optimal commonality scales and specificity models for attitude, social influence, and PBC influence exercise intention, and behavior.

Purpose 2 was to investigate the TPB as a mediator between personality, and exercise behavior. Results indicated a significant ($p<.05$) direct effect for extraversion's activity facet on exercise behavior. This finding suggests the TPB is insufficient to account for the influence of personality upon exercise behavior and supports the importance of the activity trait in exercise behavior prediction.

Purpose 3 was to investigate an exploratory analysis of the moderating influence of personality on the TPB. Overall, four significant moderating effects ($p<.01$) were found for undergraduates. Specifically, moderating effects of E for the effect of affective attitude upon intention, O for the effect of instrumental attitude upon intention, and C for the effects of self-efficacy upon intention, and intention upon exercise behavior were

identified. In contrast, no moderating effects of the FFM were found significant ($p<.01$) upon the TPB among cancer survivors. Theorized influences for the presence and absence of personality moderators were discussed in the context of both samples.

Finally, purpose 4 was to investigate the TPB as a mediator between effects of demographics on exercise behavior, as well as any possible moderating relationship. Models indicated that the TPB was insufficient to mediate gender, as it had a significant ($p<.05$) effect on intention (cancer survivors) and behavior (undergraduate students). Demographic characteristics were not found to moderate the TPB.

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CHAPTER 1: INTRODUCTION

Exercise Benefits

The benefits of exercise have been well-documented (Bouchard, Shephard, & Stephens, 1994). Many randomized clinical trials now show that appropriate exercise programs may be expected to yield improvements not only in physical fitness but also in blood lipid levels, blood pressure, body composition, bone density, insulin sensitivity, and glucose tolerance (Blair, Wells, Weathers, & Paffenbarger, 1994). Further, it is reasonable to assume that these improvements reduce morbidity and mortality rates through curtailing hypertension, coronary heart disease, stroke, diabetes, cancer, obesity and osteoporosis. As well, research suggests the benefits of regular exercise extend beyond the primary prevention of chronic diseases. Emphasis on physical rehabilitation, improved mental well-being, and increased perceptions of quality of life are also important benefits of regular exercise (Fox, 1997; Mutrie & Biddle, 1995).

Exercise Adherence

Despite both primary prevention and tertiary prevention / rehabilitation benefits, a majority of the adult population are either sedentary or exercise with a frequency, duration, and intensity too low to derive any of these substantial advantages (Stephens & Caspersen, 1994). To compound this problem, exercise adherence is a major challenge for health professionals regardless of demographic profile of the group or the purpose of the exercise. It is estimated that over 50% of people will drop out of their attempted exercise routine within six to twelve months of initiation (Dishman, 1988; Robison & Rogers, 1994). Therefore, considering these abject statistics despite exercise benefits, it is

important to understand what factors influence regular exercise in order to implement effective intervention strategies.

The Theory of Planned Behavior

A multitude of factors summarized by ecological, social-cognitive, demographic, and personality frameworks have been examined to study determinants of exercise behavior. However, an understanding of the influences upon regular exercise is likely to be guided by theoretical structure (Courneya, 2001). One well-researched social-cognitive model of expectancy-value is the theory of planned behavior (TPB; Ajzen, 1985, 1988, 1991). The TPB is an extension of the theory of reasoned action (TRA), a model used prevalently in social psychology (Olson & Zanna, 1993). Both models were designed to provide parsimonious explanations of informational and motivational influences on behavior, and can be considered deliberative processing models. The TRA suggests that the proximal determinant of volitional behavior is one's intention to engage in that behavior. Intentions represent a person's motivation in the manifestation of a conscious plan or decision to exert effort to enact the behavior. As such, intentions and behavior are expected to possess a strong relationship when measured at the same level of specificity in action, target, context, and time frame (Fishbein & Ajzen, 1975). Attitudes and subjective norms are suggested to exert their effects upon behavior through intentions in the TRA. Attitudes are the overall affective and instrumental evaluations of performing the behavior by the individual. Subjective norms consist of a person's beliefs about whether significant others think he or she should engage in the behavior, and are assumed to assess the social pressures on the individual to perform or not to perform a particular behavior. However, in suggesting that behavior is solely under the control of

intention, the TRA restricts itself to volitional behaviors. The TPB tries to also predict non-volitional behaviors by incorporating perceptions of control over performance of the behavior as an additional predictor (Ajzen, 1988; Ajzen, 1991). Perceived behavioral control (PBC) is the individual's perception of the extent to which performance of the behavior is easy or difficult, or one's confidence in her or his ability to perform the behavior (Ajzen, 1991). Ajzen (1985, 1988, 1991) argues the concept is similar to Bandura's (1986) concept of self-efficacy, and seen as a continuum with easily executed goals at one end and goals demanding resources, opportunities, and skills at the other. Consequently, the link between PBC and behavior suggests we are more likely to perform behaviors that we have control over than ones in which we perceive minimal control.

TPB and Exercise

Empirical reviews of the TPB and its predecessor, the TRA, have supported a relationship for the prediction of exercise (Blue, 1995; Godin & Kok, 1996; Hausenblas, Carron, & Mack, 1997; Spence et al., 2001). Generally, intention and PBC explain about 36% of the variance in exercise behavior, with intention being a significant determinant in all studies and PBC being significant in roughly 50% of studies (Godin & Kok, 1996). Further, attitude, subjective norm, and PBC together explain approximately 40% of the variance in intention (Godin & Kok, 1996). However, the construct of subjective norm has not performed well in explaining exercise intentions across studies, typically being either non-significant or of small significant magnitude.

Hierarchies or Components within the TPB

The majority of previous research utilizing the TPB within the exercise domain has modeled attitude, subjective norm, and PBC as single concepts. However, evidence suggests that these TPB concepts may be comprised of more specific components. Unfortunately, no studies in any domain have examined whether multiple concepts of attitude, social influence, and PBC act as single constructs, or whether two concepts are responsible for the prediction of exercise intention and behavior. Instead, researchers have either included concepts as correlated predictors, or summed these concepts together to produce a hypothesized single concept. Certainly answering this research question will offer greater parsimony and conceptual understanding for tailored intervention strategies. Further, the conceptualization of the relationships between these TPB components has been underdeveloped, and therefore, a more intricate analysis and careful conceptualization of TPB concepts is warranted.

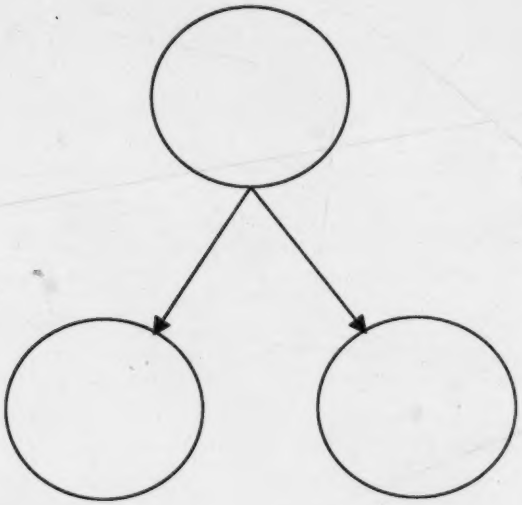
Affective and Instrumental Attitude

Based on the work of Rosenberg (1956) identifying relationships between distinct concepts of attitude, Ajzen & Driver (1991) hypothesize that distinct attitude concepts for a behavior may have a common second order cause (Figure 1.1a). Specifically, affective (e.g., enjoyable/unenjoyable) and cognitive/instrumental (e.g., beneficial/harmful) attitude components are conceptualized to be caused from a common overall attitude concept. Conner & Armitage (1998) relate this distinction to measures of anticipated affective reactions versus standard attitude measures, whereas Manstead & Parker (1995) believe differences are derived from temporal distinctions in evaluation. Despite the differences of causality in the identified literature, these concepts more likely act as

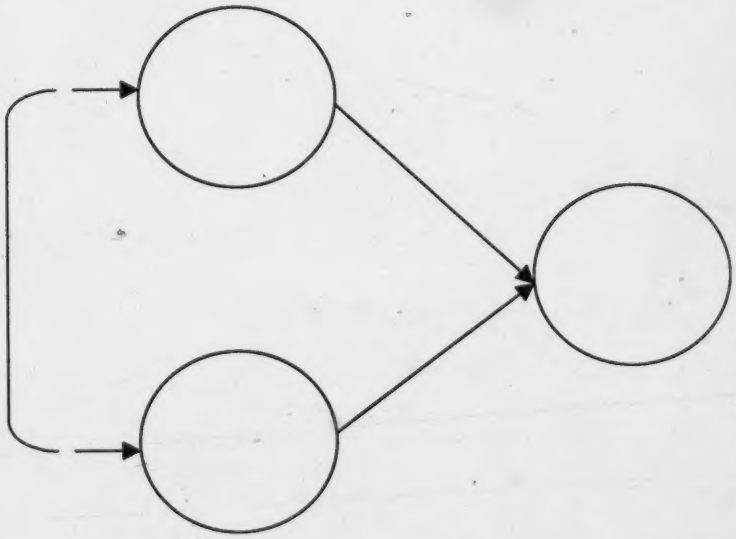
influential components of a general attitude concept (Figure 1.1b) than a second order common cause. Further, the relationship between these components may arise from exogenous common causes (e.g., previous exercise experiences, demographics, lifestyle factors, and personality) rather than a second order concept. This alternative model is conceptually distinct from a second-order conceptualization. For example, in this conceptualization, changes in social-cognitive concepts such as affective or instrumental attitude (e.g., changes by an intervention) will directly influence overall attitude. In contrast, changes of affective or instrumental attitude in the second order model could not influence overall attitude, as overall attitude is conceptualized to cause (but not to receive effects from) these concepts. The conceptualization of the second order model is common in personality research, whereby traits are conceived as stable (Costa & McCrae, 1995), but as suggested in this example, it makes less conceptual sense for more dynamic or changeable social-cognitive concepts.

FIGURE 1.1 STATISTICALLY EQUIVALENT, YET CONCEPTUALLY DISTINCT MODELS OF GENERALIZED CONCEPTS AND THEIR HYPOTHESIZED COMPONENTS

A)



B)



Self-Efficacy and Perceived Volitional Control

Similar to attitude, PBC is now thought to include two distinct components of self-efficacy (e.g. ease/difficulty of performing the behavior, confidence in one's ability to perform the behavior) and controllability (e.g., personal control over behavior, appraisal of whether the behavior is completely up to the actor; Ajzen, 2001). Controllability and self-efficacy has been utilized interchangeably in past research as (Ajzen, 1991) regarded the two constructs as synonymous and some exercise studies using the TPB have utilized self-efficacy instead of PBC based upon their hypothesized similarity (e.g., Rodgers & Brawley, 1993; DeVries et al., 1988). Further, although factor analytic research has consistently identified construct differentiation, this research has not come to an agreement as to the conceptual distinction between these components. For example, Terry and O'Leary (1995) suggest that the self-efficacy component of PBC refers to internal control while the controllability component refers to external control. In contrast, Ajzen (2001) suggests that self-efficacy and controllability both measure both internal and external control, but does not offer a clear definition of the operational differences between these concepts.

In this dissertation, the distinction of these PBC concepts is conceptualized slightly differently from the previous research, but certainly the distinction between these concepts is not clean. An item-level examination suggests that the concept Ajzen (2001) labels controllability is tapping primarily into an assessment of whether the behavior is under volitional control, whilst confidence items tap self-efficacy. While I agree with Ajzen (2001) that perception of personal control of a behavior can be perceived as both internal and external, the item "behavior X…is entirely up to me" clearly reflects an

appraisal of volitional control. That this item indicates the lowest factorial complexity in principle components analysis between self-efficacy and PBC items (Armitage & Conner, 1999a, 1999b; Manstead & Van Eekelen, 1998) also supports this conceptualization. Moreover, this item contains comparable principle component factor loadings on the latent concept as the "control" items (Armitage & Conner, 1999a, 1999b; Armitage et al., 1999; Manstead & Van Eekelen, 1998; Terry & O'Leary, 1995), suggesting that these items also primarily tap appraisal of volitional control. However, "control" items are still likely to be more predictive of intention and behavior than "behavior x is up to me" items since they likely include self-efficacy variance beyond simple appraisal of volitional control.

I also agree with Ajzen (2001) that self-efficacy clearly includes appraisal of all aspects of control. Based on this conceptualization, one's self-efficacy is likely to influence intention more than one's assessment of volitional control, since self-efficacy represents a broader appraisal of control than just volitional control. Statistically, this conceptualization is indicated by the higher variability of self-efficacy in comparison to the volitional control concept (e.g., Terry & O'Leary, 1995; Armitage & Conner, 1999a), and that self-efficacy has generally been the significant predictor of intention in all studies investigating the two concepts (Armitage & Conner, 1999a, 1999b; Armitage et al., 1999; Manstead & Van Eekelen, 1998; Povey, Conner, Sparks, Rhiannon, & Shephard, 2000; Sparks, Guthrie, & Shepherd, 1997; Terry & O'Leary, 1995; see appendix A).

Ajzen (2001) has proposed that the relationship between self-efficacy and controllability results from a second order concept, and that this concept may be the

important construct within the TPB. However, no clear conceptualization for this second order relationship has yet been proposed, other than evidence that the concepts of self-efficacy and volitional control are related.

For the prediction of behavior, I conceptualize that either self-efficacy or volitional control may predict behavior when controlling for intention to the extent that they may be actual reflections of ability and volitional control respectively. In line with this conceptualization, self-efficacy predicted behavior when controlling for intention in four of six studies to examine the PBC distinction (Armitage & Conner, 1999a, 1999b; Armitage et al., 1999; Manstead & Van Eekelen, 1998). However, the only study to investigate this PBC distinction within the exercise domain found volitional control significantly predicted behavior (Terry & O'Leary, 1995).

Given only one study of distinct PBC components in the exercise domain, more research is required to validate these findings. Further, although Ajzen's (2001) hypothesized second order model for PBC is not equivalent with my conceptualization of the relationship between social-cognitive TPB components (see figure 1.1b), a formal test of whether self-efficacy and volitional control act on intention/ behavior as a single construct or whether two concepts is warranted.

Social Influence Constructs: Injunctive Norm, Descriptive Norm, and Social Support

Social influence within the TPB in the exercise domain may be comprised of three distinct concepts. Subjective norm is hypothesized to include both the more traditionally measured injunctive component (e.g., whether one believes their social network wants them to perform the behavior) as well as a descriptive component

(whether one's social network performs a behavior; Ajzen, 2000). The recent addition of descriptive norm reflects growing empirical support for its predictive validity upon behavioral intention (Conner & Sparks, 1996; Nucifora et al., 1993; Sheeran & Orbell , 1999; White et al. 1994) and theoretical support by extending normative pressure to include social pressure of belonging to a group who may or may not perform the behavior (White et al., 1994).

Moreover, some researchers have found social support to be another social influence concept with predictive utility for the TPB in the exercise domain (Courneya & McAuley, 1995). Social support has been the most studied social construct in exercise behavior research (Chogohara et al., 1998). A literature review of social support and exercise since 1985 identified only 3 of 39 studies with a non-significant relationship (see appendix B). These results are especially supportive given the different experimental designs, measures, populations, and theoretical frameworks in which social support and exercise have been investigated. Further, although definitions of social support vary, almost all studies reference support, encouragement, or assistance received from others (Sallis et al., 1987). As such, an important conceptual difference between subjective norm and social support appears that while subjective norm refers to the perceived pressure from others to perform a behavior, social support refers to the perceived assistance from others in performing that behavior (Courneya et al., 1999). This suggests that subjective norm possess the normative component of social influence while social support is a component of perceived control or confidence (Courneya & McAuley, 1995). In support of this theorizing, (Bandura, 1986) contends that self-efficacy serves a mediational role in the relationship between social support and health promoting

behaviors. Futher, this mediational role has been demonstrated in the exercise domain (Duncan & McAuley, 1993; Duncan & Stoolmiller, 1993).

Finally, the discriminant validity of subjective norm and social support has already been demonstrated in the exercise domain (Courneya & McAuley, 1995), though two studies have utilized social support with predictive success in lieu of subjective norm in the theory of planned behavior for the prediction of exercise (Horne, 1994; Wankel et al., 1994). However, research is required with the inclusion of all three conceptualized constructs (i.e., injunctive norm, descriptive norm, and social support) in the TPB framework in order to compare their predictive and conceptual properties amongst other constructs.

Purpose 1

Purpose 1 in this dissertation was to investigate multiple components of these TPB concepts for the prediction of exercise intention and behavior. Specifically, multiple components of attitude (affective, instrumental), social influence (injunctive norm, descriptive norm, social support), and PBC (self-efficacy, perceived volitional control) were investigated as specific concepts compared to hypothesized commonality scales acting as unitary constructs within the TPB. Further, I wished to investigate a TPB model with the inclusion of all these components and examine the effects of each concept and overall model fit. Finally, to test the replicability of these findings, I examined these research questions upon two distinct samples. Study 1 models the TPB with a convenience sample of undergraduate students, while study 2 models the TPB with a population sample of cancer survivors.

The Theory of Planned Behavior and External Variables

Concepts external to attitude, social influence, and PBC are hypothesized to be mediated by the TPB (Ajzen, 1991). External variables are hypothesized to exert their respective influence on a behavior through attitude, social influence, and perceptions of control. However, any concept that influences behavior while controlling for the TPB may be a useful addition to the theoretical structure (Ajzen, 1991). Currently, the only concept that has had consistent additional predictive merit is past behavior. Past behavior, however, does not add theoretical or practical value to the TPB. Theoretically, I believe past behavior is not a cause of future behavior and any relationship between the two concepts is likely from common causes (e.g., social cognition). Also, from a practical position, past behavior serves no additional information for intervention strategies. An alternative possibility is that external concepts moderate the TPB. That is, disparities in external concepts among individuals differentially influence the relationships of TPB concepts upon intention and/or behavior. Both these possible effects move beyond the simple structural approach and identify factors, mechanisms, and processes that link external concepts, social cognition, and behavior. Therefore, interventions can be targeted towards these social-cognitive constructs with an understanding of their underlying association with other external concepts.

The remaining purposes in this dissertation investigate the relationship of the TPB with two key correlates of exercise behavior considered external to the TPB proper: personality and demographic characteristics.

Personality and Exercise

Given their stable consistency across situations, motivational properties, and enduring nature (McCrae & John, 1992), personality traits are a significant factor for understanding exercise-related behavior and adherence (Schnurr et al., 1990). Personality traits can be defined as dimensions of individual differences in tendencies to show consistent patterns of thoughts, feelings, and actions (McCrae & Costa, 1990). As such, the more of a trait people possess, the more likely they are to display the behavior it disposes.

Although several pathways for how personality interacts with health have been postulated, personality traits are hypothesized to influence exercise through a health behavior model (Wiebe & Smith, 1997). This position hypothesizes that the principle impact of personality influences health-oriented behaviors through the quality of one's health practices. Twenty-one studies have examined personality models as determinants of exercise (see appendix C). However, several competing models of trait theory in personality psychology have been utilized in these studies. Therefore, it is necessary to review the relationship of personality as a determinant of exercise behavior within the framework of the currently utilized personality models.

Cattell's 16 Primary Factors

Cattell (1947) was one of the early users of factor analysis in personality trait research. Arguing that traits must be determined empirically, Cattell used the lexical approach of personality trait development by looking at commonalties in descriptors in natural language (Goldberg, 1993). This approach assesses the importance of a trait based on how many words describe it (known as lexical criterion of importance). Using

this approach, Cattell (1947) developed the following 16 dimensions as traits that make up a model of personality: cool-warm, concrete-abstract thinking, affected by feelings-emotionally stable, submissive-dominant, sober-enthusiastic, expedient-conscientious, shy-bold, tough-tender minded, trusting-suspicious, practical-imaginative, forthright-shrewd, self-assured-apprehensive, conservative-experimenting, group-oriented-self-sufficient, undisciplined-controlled, relaxed-tense. Further, Cattell (1947) also included 2 super factors, or second order factors that encompass these 16 dimensions: extraversion and anxiety / neuroticism. These 16 dimensions and super-factors are measured using the 16 Personality Factor questionnaire (16 PF; Cattell, 1977). Unfortunately, research with the 16PF as a leading model of personality theory has not been entirely successful as no one has been able to reproduce all 16 factors from Cattell's (1947) work (Digman, 1990). Therefore, a 16 factor model of personality is unlikely to be an accurate and generalizable model of trait personality. Nevertheless, the 16 PF has been utilized in one cross-sectional and one prospective study in the exercise domain. Renfrow and Bolton (1979) compared middle-aged regular exercisers and non-exercisers in a cross-sectional study that identified significant differences in higher scores for non-exercisers in the traits of conscientiousness, outgoing (bold), and shrewdness. In contrast, regular exercisers scored significantly higher on the traits of liberalness (experimenting), and self-sufficiency. Howard et al. (1987) correlated fitness tests with the 16 PF in a five-year prospective study of middle management executives engaging in a fitness program. Fitness correlated positively with outgoing (bold), venturesomeness (experimenting), self-sufficiency, relaxedness, and the super-factor extraversion. Conclusions for associations of the 16 PF and regular exercise are difficult when summarizing these two

studies because of differences in exercise related measures utilized (fitness tests versus exercise identity) and methodology. Consequently, self-sufficiency and experimenting were the only traits significantly associated with the exercise related measures in both studies.

Eysenck's EPI

Unlike the lexical approach used by Cattell (1947), Eysenck (1967) based his trait model on biological functioning of the nervous system. Eysenck (1967) developed two super-traits that could distinguish personality: extraversion (E; sociability, craving for excitement, liveliness, activeness, & dominance) and neuroticism (N; emotional stability with distress, modiness, anxiety, & depression). A final super-trait, psychoticism (P; a tendency towards psychopathic and psychotic behavior), was subsequently added to the model (Eysenck & Eysenck, 1976), however it is far less studied than E and N. Measuring these traits with the Eysenck personality inventory (EPI; Eysenck & Eysenck, 1975), Eysenck (1967) believes the super-traits should not be broken down into facets (like Cattell's 16 PF) as they are of more importance at a higher hierarchy for research than smaller traits. Six cross-sectional and two prospective/longitudinal studies have investigated exercise behavior and the EPI. Further, another prospective exercise study has investigated the super-traits of E and N similar to Eysenck's (1967) definition using the Maudsley personality inventory (Massie & Shephard, 1971). In five of the six cross-sectional studies, low scores on N were significantly associated with exercise, while high scores on E were significantly associated with exercise in four of the six studies (see table 1.3). In contrast, in the prospective studies, high E was significantly associated with drop-out while N was non-significant in the two to utilize the EPI or Maudsley

personality inventory (Yeung & Hemsley, 1997a; Massie & Shephard, 1971). Finally, low N was significant and E non-significantly correlated with exercise behavior in a one-year longitudinal study (Potgieter & Venter, 1995). Poor variability among participants in the two prospective studies may explain the discrepancies in the findings from the other studies. For example, individuals that agreed to participate in the exercise program may have all scored low on N thus reducing the variability to significantly associate N with exercise. Overall, it appears that low N and high E are significantly associated with regular exercise behavior. High scores of Eysenck & Eysenck's (1976) third factor, P, was significant for non-exercisers in only one of eight studies using the EPI.

The Five Factor Model

Based on a large body of continuing research, many personality researchers now agree upon five super-trait domains of personality: 1) neuroticism (N, tendency to experience negative affect); 2) extraversion (E, gregariousness, activity); 3) openness to experience (O; intellectual curiosity, awareness of inner feelings, need for variety in actions); 4) agreeableness (A; altruism, emotional support, helpfulness); and 5) conscientiousness (C; will to achieve, dependability, responsibility) (Costa & McCrae, 1992a; Digman, 1990; Goldberg, 1993; McCrae & John, 1992; Wiggins, 1996; Wiggins & Trapnell, 1997). Beginning from research in the lexical tradition (Goldberg, 1993), this five-factor model (FFM) attempts to be a comprehensive version of trait theory (McCrae & John, 1992). Consequently, Goldberg (1981) proposed that these five factors encompass the theoretical organizations of such personality paradigms as Cattell (1957), Eysenck (1967), Guilford (1975), and Wiggins (1980). Therefore, the support for only five factors in which to study personality as a comprehensive language and framework

has been greeted with great enthusiasm by many (Digman, 1990; Goldberg, 1993; Wiggins & Trapnell, 1997), but not all (Block, 1995; Eysenck, 1992) personality researchers. The FFM attempts to represent the highest hierarchical level of trait taxonomy (McCrae & John, 1992). Therefore, it is not the intention of the FFM to exhaust personality description. However, if a criterion of interest is not found to be significantly associated with a five-factor domain, it is unlikely that this criterion is associated with personality traits (Wiggins & Trapnell, 1997). Unlike other major models of personality, the FFM does not utilize only one measurement instrument / inventory. Several researchers have developed inventories for FFM assessment such as the NEO-PI-R, and NEO-FFI (Costa & McCrae, 1992b), Hogan Personality Inventory (Hogan, 1986), Goldberg's 100 unipolar markers (Goldberg, 1992), Saucier's mini markers (Saucier, 1992), and an extension of Wiggin's Interpersonal Circumplex Model (Trapnell & Wiggins, 1990). Differences are evident among these measures (Goldberg, 1992; Saucier, 1992), but all inventories attempt to measure the FFM.

Four studies have examined the FFM and exercise behavior (see appendix C), while one study has correlated the FFM with measures of physical fitness (Hogan, 1989). Of these five factors, C and E, were positively associated with exercise, while N was negatively associated in all studies. High scores of conscientiousness represents a purposeful, self-disciplined individual (Digman, 1990; McCrae & John, 1992), suggesting that this factor may be important in terms of adherence behavior. N represents the proneness of the individual to experience unpleasant and disturbing emotions and to have corresponding disturbances in thoughts and actions (Vestre, 1984). Finally, E concerns the differences in preference for social interaction, and lively activity (Costa &

McCrae, 1992a), although (Watson & Clark, 1993) outline positive affect as its core concept.

Providing greater clarity of what properties of the five-factors associate with exercise behavior is likely to improve the understanding of their relationship. Costa & McCrae (1980) theorize that global estimates do not allow much precision in showing which forms of a trait domain are most characteristic of a person or behavior. Therefore, the NEO-PI-R (Costa & McCrae, 1992b) identifies 30 facets underlying the five general domains to provide a more fine-grained analysis. Similarly, Saucier (1998) has identified a more modest 14 facets underlying the five factor structure of the shorter NEO-FFI (Costa & McCrae, 1992b). These facets, combined with the advantage of the NEO-PI-R / NEO-FFI containing no specific exercise-related items, may allow for greater understanding of the role of personality as predictors of exercise behavior free of content contamination. Presently, no published research has examined the NEO-PI-R or NEO-FFI facets and exercise behavior directly.

The Theory of Planned Behavior, Personality, and Exercise

The effect of broad personality dispositions upon health-related behavior has been hypothesized to result through intermediate effects of more variable cognitions or social-environmental contexts (Bermudez, 1999). Therefore, interventions can be targeted towards social-cognitive constructs with an understanding of their underlying associated personality traits. Two mechanisms of the relationship between personality, social cognition, and behavior have been proposed. Some social-cognitive theories propose that specific cognitions should mediate the relationship between personality and behavior (Ajzen, 1985; Bandura, 1986; Fishbein & Ajzen, 1975), while other models propose

personality has a moderating influence (Becker & Maiman, 1975; Rogers, 1975; Triandis, 1979).

Mediating Hypothesis

Research examining the mediating effect of the TPB between personality and exercise behavior among younger females has demonstrated that the TPB is insufficient to completely account for personality (Courneya, Bobick & Schinke, 1999; Rhodes, Courneya, & Jones, 2001). In this research, the FFM was utilized as a framework of personality, and identified that extraversion provided a significant direct effect upon exercise behavior when controlling for the TPB (Courneya, Bobick, & Schinke, 1999). Further, Rhodes et al. (2001) found that E's facet of activity possessed the significant effect upon exercise behavior rather than general E or the facets of positive affect and sociability. The activity facet describes people who often keep busy, act vigorously, talk rapidly, and are energetic and forceful (McCrae & Costa, 1990). By this description, active individuals may engage in exercise behavior beyond their planned intention because they frequently seek situations where the opportunity to be active presents itself. In contrast, individuals less disposed to general activity would experience fewer opportunities than their active counterparts to exercise beyond their planned exercise behavior. This hypothesis is in accordance with the research on extraversion by Eysenck (1981), suggesting that extraverts and introverts differ in levels of arousal from the reticular activating system in the cerebral cortex. Introverts are hypothesized to possess higher base rates of arousal than extraverts, motivating them to withdraw from stimulation. Conversely, extraverts actively seek out stimulation in order to compensate for their low cortical arousal, and one key facet for this outlet may be activity.

The findings of these studies have both theoretical and applied implications. From an applied perspective, this research suggests that an understanding of personality may assist applied social psychologists in developing more effective interventions for promoting exercise participation. Theoretically, this research identifies that the TPB is not adequate to explain the relationship between personality and exercise behavior. However, these studies utilized a TPB model that did not include separate concepts for affective and instrumental attitude, descriptive norm, social support or self-efficacy. Research with extended TPB models may eliminate the direct effect of personality on exercise behavior. Further, this research utilized convenience samples of young females and requires replication on more disparate samples for evidence of generalizability.

Purpose 2

Purpose 2 in this dissertation was to investigate the mediating hypothesis between personality, exercise, and the TPB using an extended TPB model that includes concepts of affective and instrumental attitude, descriptive and injunctive norm, social support and self-efficacy. It was hypothesized that E's activity facet would still significantly influence behavior while controlling for this extended TPB model, given that activity is theorized to influence behavior free of conscious planning (Courneya et al., 1999; Rhodes et al., 2001). To test the replicability of the findings, we examined these research questions with two distinct samples. Study 1 models personality and the TPB with a convenience sample of undergraduate students, while study 2 models personality and the TPB with a sample of cancer survivors.

Moderating Hypothesis

As mentioned previously, other social-cognitive models propose personality may have a moderating influence upon social cognition. For example, Triandis (1979) hypothesized that high N individuals may be impaired in their intention-behavior correspondence in comparison to those low in N. However, no research has investigated the potential moderating role of the FFM upon social cognition in the exercise domain.

Purpose 3

Purpose 3 was to investigate the moderating influence of the FFM upon the theory of planned behavior. Although an exploratory analysis of all possible moderation effects was conducted, it was hypothesized that the order, goal-striving, and self-discipline associated with high C individuals would result in significantly stronger effects of social cognition upon intentions and intentions upon behavior than those low in C. Similarly, it was expected that the self-consciousness, vulnerability to distress, anxiety, and depression in high N individuals would impair these same relationships in comparison to those low in N. Finally, to test the replicability of the moderation findings, we examined these research questions upon two distinct samples. Study 1 models personality and the TPB with a convenience sample of undergraduate students, while study 2 models personality and the TPB with a sample of cancer survivors.

The Theory of Planned Behavior, Demographic Characteristics, and Exercise

Since the inception of the study of physical activity and exercise behavior, demographic characteristics have been found as significant correlates (Dishman, 1994). For example, research over the last two years identifies significant relationships between exercise behavior and age (Booth, Owen, Bauman, Clavisi, & Leslie, 2000; Sternfeld,

Ainsworth, & Quesenberry, 1999), gender (Booth et al., 2000; Martin, Morrow, Jackson, & Dunn, 2000), education (Steptoe, Rink, & Kerry, 2000, Wilcox, Castro, King, Housemann, & Brownson, 2000), and employment- and marital status (Sternfeld et al., 1999). Regular exercisers are more likely to be younger, male, of high education, employed, and unmarried in comparison to non-exercisers.

However, given that demographics are not yielding to change, it is important to understand their relationship with exercise related social-cognition in order to design effective interventions to off-set the relationships between demographics and exercise behavior. Presently, a paucity of research exists that has investigated either the mediating role of the TPB between demographics and exercise behavior or the moderating role of demographics upon exercise related social-cognition.

For example, no research has examined the hypothesized mediation effect of the TPB between demographics and exercise behavior. Further, the evidence among other health behaviors is currently mixed with the mediation effects of gender supported for minimization of sun exposure (Steen, Peay, & Owen, 2000), condom use, binge drinking, and drunk driving (Armitage et al., 2001 study 1), but not for health screening attendance (Armitage et al., 2001 study 2).

The possibility of moderation effects of demographics upon the TPB and exercise has only been investigated by one study (Wankel, et al., 1994). This research found that gender did not moderate the theory of planned behavior among a population sample, while moderating effects were present for age. Specifically, effects of attitude were significantly more influential upon intentions for younger adults than older adults, while PBC and social support were more influential upon intentions for older adults than the

youngest age group. However, no research has investigated the possible moderating effects of other demographics such as employment status, and education.

Purpose 4

Purpose 4 was to investigate the mediating hypothesis between demographics, exercise, and the TPB as well as to investigate the possible moderating influence of demographics upon the TPB within the exercise domain. For the mediation hypothesis, it was hypothesized that no demographic characteristic would have a significant effect upon exercise behavior while controlling for the TPB based on the tenets of the TPB (Ajzen, 1991). The moderating analysis was considered exploratory, and therefore a priori hypotheses were limited. Still, no moderating effects of demographic characteristics are hypothesized within the tenets of the TPB (Ajzen, 1991).

Finally, to test the replicability of both the mediation and moderation findings, we examined these research questions upon two distinct samples. Study 1 models gender and the TPB with a convenience sample of undergraduate students, while study 2 models gender, age, education, marital status, and employment status, and the TPB with a sample of cancer survivors.

CHAPTER 2: METHOD

Participants and Procedure

Study 1

Participants for study 1 were 303 (223 female and 80 male) undergraduate students participating in the study for extra credit in their introductory psychology course. The participants attended large group sessions during January and February, completing the self-report measures of the TPB at their own pace. Three hundred of these participants completed a two-week follow-up measure of exercise behavior. The mean age of participants was 19.99 (SD = 3.65 yrs) and the mean year in university for the sample was 1.67 (SD = 1.02). The variance / covariance matrix for the indicators of the relevant concepts was created using pair-wise deletion of missing data, and resulted in a mean analysis of 300 participants.

Study 2

Participants for study 2 were breast, prostate, colon, and lung cancer survivors diagnosed between January 1998 and December 1998 who had completed surgery and adjuvant therapy. Eligible participants (N = 577) were randomly selected from the provincial cancer registry and mailed a questionnaire package. The questionnaire package included a notice of research study (appendix D), two copies of informed consent (appendix E), a questionnaire booklet, and a self-addressed stamped envelope. Participants were asked to complete and return one copy of the informed consent along with the questionnaire at the earliest convenience. The mail protocol was based on the Total Design Method (Dillman, 1983) to maximize response rates. This method consists of: 1) mailing the initial questionnaire packet, 2) mailing a postcard reminder 1 week

later, and 3) mailing a second questionnaire packet 3 weeks later to all those who did not respond to the first mailing and postcard reminder.

Completed questionnaires were received from 302 (52.3%) of the eligible participants (203 breast cancer, 83 prostate cancer, 12 colon cancer, 4 lung cancer). The descriptive profile of the participants was: mean age of 60.7 (SD = 11.2) years, 69.8% were female, 77.4% were married or common-law, 40.6% had a university education, and 36.6% were currently working full or part-time. Further, 75.4% reported having surgery, 43.1% had chemotherapy, and 83.4% had radiotherapy. The variance / covariance matrix for the indicators of the relevant concepts was created using pair-wise deletion of missing data, and resulted in a mean analysis of 272 participants.

Instruments

Regular exercise was defined for all participants in study 1 as activities performed at a vigorous intensity 3 or more times per week for at least 30 minutes each time. Regular exercise was defined for all participants in study 2 as activities performed at least at a moderate intensity 3 or more times per week for at least 20 minutes each time. Participants were asked to use these definitions when answering all exercise-related questions.

Exercise Attitude

Exercise attitude was measured using 7 point bipolar adjective scales as suggested by (Ajzen & Fishbein, 1980) and Ajzen (2000). The three items utilized to tap the instrumental attitude concept were: useful-useless, wise-foolish, beneficial-harmful. In contrast, the three items used to tap the affective attitude concept were: enjoyable-unenjoyable, interesting-boring, relaxing-stressful. The statement that preceded the

adjectives was "For me, exercising regularly is…". Scales utilizing these items have demonstrated acceptable reliability among both undergraduate students (Courneya et al., 1999) and cancer survivors (Courneya & Friedenreich, 1997; Courneya et al., 1999) in previous exercise research. See appendix F.

Social Influence

Social Influence was measured by 7 point scales that ranged from 1 (strongly disagree) to 7 (strongly agree). For measurement of the injunctive norm concept, the items were: (1) "Most people in my social network want me to exercise regularly in the next 2 weeks", and (2) "Most people in my social network would approve if I exercised regularly in the next 2 weeks". Scales utilizing these items have demonstrated acceptable reliability among both undergraduate students (Courneya et al., 1999) and cancer survivors (Courneya & Friedenreich, 1997; Courneya et al., 1999) in previous exercise research. See Appendix G.

For measurement of the descriptive norm concept the items were: 1) "most of my friends exercise regularly", 2) "most of my family members exercise regularly", and 3) "Most of my co-workers exercise regularly". These items were created in the format suggested by Ajzen (2000) and similar to descriptive norm items from previous research (Sheeran & Orbell, 1999). See appendix H.

To improve power and reduce proportionality constraints within multiple structural equation models, only items 1 and 2 were utilised for purpose two, three, and four given that these items were hypothesized to be most inclusive of the descriptive norm concept.

For measurement of the social support concept the items were: 1) "People in my social network are likely to help me exercise regularly over the next 2 weeks", 2) "There is no one in my social network that I can turn to for assistance with regular exercise over the next two weeks (reversed scored)", and 3) I feel that someone in my social network will provide the support I need in order to exercise regularly over the next 2 weeks". These items were created for the present study focussing on the scale creation format for TPB concepts suggested by Ajzen (2000) and the present definition of social support for exercise. See appendix I.

To improve power and reduce proportionality constraints within multiple structural equation models, only items 1 and 3 were utilised for purpose two, three, and four given that these items were hypothesised to possess the best clarity of the social support concept.

Perceived Behavioral Control

Perceived behavioral control was measured by three items used to tap the volitional control concept and three items used to tap the self-efficacy concept. These items were adapted for the exercise domain from previous research by Conner and colleagues (Armitage & Conner, 1999a, 1999b; Armitage et al., 1999). This research identified that the self-efficacy and volitional control scales had acceptable reliabilities and good concept differentiation in principle components analysis.

Self-efficacy was measured by the following items: 1) "How confident are you that you will be able to exercise regularly in the next 2 weeks?"; on a 7-point scale ranging from 1 (very unconfident) to 7 (very confident), 2) "How confident are you over

the next two weeks that you could overcome obstacles that prevent you from exercising regularly?"; on a 7-point scale from 1 (completely unconfident) to 7 (completely confident), and 3) I believe I have the ability to regularly exercise in the next 2 weeks"; on a 7-point scale from 1 (definitely do not) to 7 (definitely do). See appendix J.

Volitional control was measured with the following items: 1) "Whether or not I exercise regularly in the next 2 weeks is entirely up to me"; on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree), 2) "How much personal control do you feel you have over exercising regularly in the next 2 weeks?"; on a 7-point scale ranging from 1 (very little control) to 7 (complete control), and 3) "How much do you feel that exercising regularly in the next 2 weeks is beyond your control (reversed scored)?"; on a 7-point scale ranging from 1 (not at all) to 7 (very much). See appendix K.

Given that the self-efficacy concept self-efficacy has been the significant predictor of intention and often behavior in studies investigating the two concepts (Armitage & Conner, 1999a, 1999b; Armitage et al., 1999; Manstead & Van Eekelen, 1998; Rhodes, 2001[paper 1]; Sparks, Guthrie, & Shepherd, 1997; Terry & O'Leary, 1995), only the self-efficacy concept was used in purposes two, three, and four.

Intention

Exercise intention was assessed by two items as follows: 1) "In the next 2 weeks, my goal is to exercise"; rated on a seven point scale from 1 (Not at all) to 7 (Every day), and 2) "Over the next 2 weeks, I intend to exercise _____ times per week" rated on an open scale (Courneya, 1994). These items have indicated excellent reliability among both undergraduate students (Courneya et al., 1999) and cancer survivors (Courneya & Friedenreich, 1997; Courneya et al., 1999) in previous exercise research. See appendix L.

To conserve power and reduce proportionality constraints within multiple structural equation models, only item 2 was utilised for purpose two, three, and four given that this item has shown the best scale correspondence with behavior in previous exercise research (Courneya, 1994).

Exercise Behavior

Exercise behavior was measured by the Godin Leisure Time Exercise Questionnaire (Godin et al., 1986; Godin & Shephard, 1985). The instrument contains 3 open ended questions covering the frequency of mild (e.g., easy walking), moderate (e.g., fast walking), and strenuous (e.g., jogging) exercise completed during free time. Duration of these intensities were set for at least 30 minutes for study 1 and at least 20 minutes for study 2. An independent evaluation of this found it to be easily administered, brief, and reliable and to possess concurrent validity based on various criteria including objective activity monitors and fitness indexes (Jacobs, Ainsworth, Hartman & Leon, 1993). Mild and moderate exercise were not included as an indicators of exercise behavior in study 1 due to their incongruence with our definition of regular exercise in the social cognitive measures. However, strenuous and moderate exercise were summed to produce an exercise frequency indicator for study 2 and remain congruent with its respective social cognitive indicators. See appendix M.

Personality

Personality was measured using the NEO Five-Factor Inventory (NEO-FFI; (Costa & McCrae, 1992b). This 60-item inventory measures five broad dimensions of personality (N, E, O, A, C), answered on a 5-point scale from "strongly disagree" to "strongly agree. Previous research and development of the NEO-FFI has suggested a

reliable and valid instrument for the measurement of the FFM (Block, 1995; Costa & McCrae, 1992). For the mediation hypothesis, these items were modeled as facets per domain using Saucier's (1998) division of N (anxiety, depression, & self-reproach), E (positive affect, sociability, & activity), O (aesthetic interests, intellectual interests, & unconventionality), A (pro-social orientation & non-antagonistic orientation), and C (order, dependability, & goal-striving). Saucier's (1998) facet structure suggested reproducibility on two population samples and acceptable scale reliability. For the moderating analysis, the full scales of N (undergraduates $\alpha = .85$; cancer survivors $\alpha = .87$), E (undergraduates $\alpha = .79$; cancer survivors $\alpha = .76$), O (undergraduates $\alpha = .69$; cancer survivors $\alpha = .66$), A (undergraduates $\alpha = .74$; cancer survivors $\alpha = .72$), and C (undergraduates $\alpha = .84$; cancer survivors $\alpha = .82$) were utilized. See appendix N.

Demographics and medical Profile

Demographic information was obtained from both study 1 (age, gender) and study 2 (age, gender, employment status, formal education) for a descriptive profile of the participants. Specific medical data (cancer type, diagnosis date, disease stage, surgery type, and therapy type) was also collected through self-report for the cancer survivor sample (study 2; see appendix O).

General Analysis Procedures

Analysis Procedures

All purposes in this dissertation were investigated using structural equation modeling. Structural equation modeling allows for both statistical significance tests for the size of each theoretical relation in the model and the assessment of overall model fit. Further specific conceptualizations in measurement and structure are investigated

simultaneously and adjusted for measurement error. The variance / covariance matrices for all models were created using pair-wise deletion of missing data. The final N utilized in each analysis was the mean of all pair-wise parameters. Models were estimated with maximum likelihood procedures and assessed using LISREL 8.20 for Windows (Jöreskog & Sörbom, 1997).

General Model Specification

For specification of the latent concepts, the loading for each concept's first indicator was pre-set to 1.0 in the structural equation model to create a scale. Based upon previous research identifying the proportion of error in self-reported exercise (Courneya, Estabrooks, & Nigg, 1997), the exercise behavior indicator was given a fixed error variance estimate of 40% for the structural equation models. Exogenous concepts/structural disturbance terms of attitude, social influence, and PBC were freed to correlate with the exception of self-efficacy and social support. Given the cross-sectional design of study 2, the effects on exercise behavior may be less accurate to the extent that exercise behavior over the preceding two-weeks changes from the past behavior measure utilized.

Assessment of Model Fit

A number of statistics exist to assess the adequacy of structural models (Bollen, 1989). The most useful statistic for testing nested and alternative models is the chi-square statistic (χ^2). The X^2 goodness-of-fit test assesses the adequacy of the theorized model's creation of a covariance matrix and estimated coefficients in comparison to the observed covariance matrix. Models that result in a created covariance matrix that significantly deviates from the observed covariance matrix are judged to be inadequate.

For comparison of nested and alternative models, the χ^2 difference value versus degrees of freedom difference provides a statistical test for whether the additional constraints worsen the fit of the model.

However, the χ^2 test has been criticized as an insufficient test alone to adequately assess model fit, generally because of sample size and power estimation problems or assumptions (Hu & Bentler, 1995). Therefore, inclusion of absolute and incremental fit indices are recommended (Hu & Bentler, 1999). Absolute fit indices assess how well an a priori model reproduces the sample data, while incremental fit indices measure the proportionate improvement in fit by comparing a target model with a more restricted baseline model. For the current study, root mean square error of approximation (RMSEA) was included as an absolute fit index and the comparative fit index (CFI) was included as an index of incremental fit. General rules of thumb for acceptability of model fit using these indexes are >.94 for the CFI and <.07 for RMSEA (Hu & Bentler, 1999).

CHAPTER 3: RESULTS AND DISCUSSION FOR PURPOSE 1

Results

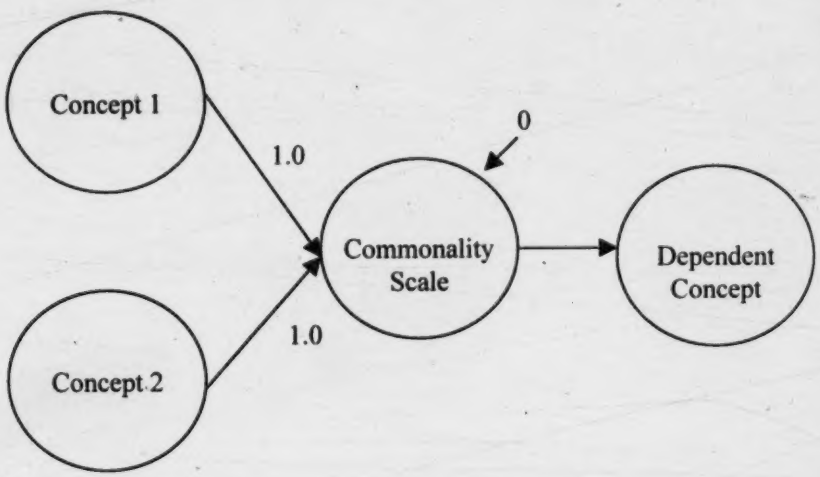
Specific Analyses Procedures

Measurement models of attitude, social influence and PBC were first examined to determine whether they are best represented as one or two underlying concepts. Models with all indicators as one concept were tested against models with correlated concepts. Concepts that indicate a significantly ($p<.05$) better χ^2 fit when modeled as separate concepts, suggest discriminant validity.

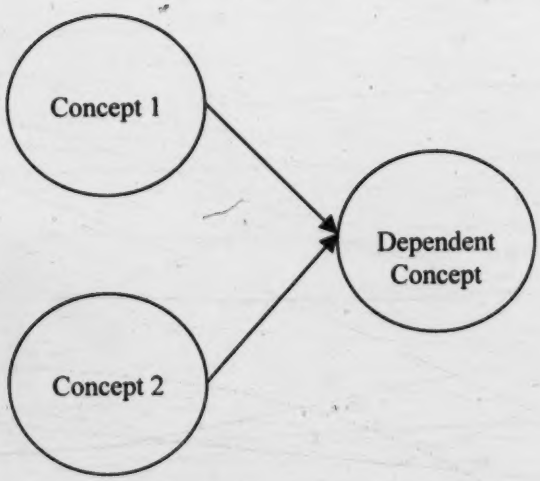
Next, each hypothesized unitary concept model (e.g., commonality model; Figure 3.1a) was modeled together in a full TPB framework. To accomplish the test of nested models, the two effects were constrained to be equal (this test is statistically equal to testing for a second order factor). This χ^2 was then tested against a model whereby effects were freed of the respective component concepts (i.e., specificity model; Figure 3.1b) for the prediction of intention, and behavior for self-efficacy and volitional control. This analysis was also achieved by the creation of phantom variables, representing general concepts of attitude, social influence, subjective norm, and PBC. The loading for the structural disturbance term for each general concept (phantom variable) was pre-set to 0 in the structural equation models for identification purposes. Moreover, effects of TPB component concepts upon these general concepts were fixed at 1.0. Without examination of the optimal operation of concepts, the sub-component model may lack the parsimony found in the general factor model. In contrast, a general factor model may lack information in the predictive disparities on intention and behavior between sub-components.

FIGURE 3.1 A UNITARY CONCEPT MODEL VERSUS SPECIFIC COMPONENT MODEL

A)



B)



Unitary Concept versus Specificity Models of Attitude, Social Influence, and PBC

Results of the discriminant validity analyses are listed in Table 3.1 and Table 3.2 for study's 1 and 2 respectively. Specifically, all concepts indicated significantly ($p<.05$) better fit when modeled as separate concepts, suggesting discriminant validity for all concepts.

TABLE 3.1 CONCEPT DISTINCTION OF THE TPB FOR UNDERGRADUATES

Model (N=300)	χ^2	DF
Attitude		
One Concept		
Two Concepts*	128.37	9
	17.80	8
Subjective Norm		
One Concept (descriptive and injunctive norm)		
Two Concepts*	47.46	5
	5.81	4
Social Influence		
One Concept(social support & injunctive norm)	103.62	19
One Concept(social support & descriptive norm)	134.41	19
Three Concepts*	38.57	17
One Concept (social support and subjective norm)	184.03	20
Two concepts *	78.85	19
PBC		
One Concept		
Two Concepts*	245.64	9
	37.39	8

* = $p<.05$

TABLE 3.2 CONCEPT DISTINCTION OF THE TPB FOR CANCER SURVIVORS

Model (N=272)	χ^2	DF
Attitude		
One Concept		
Two Concepts*	230.49	9
	35.19	8
Subjective Norm		
One Concept (descriptive and injunctive norm)	272.29	5
Two Concepts*	8.70	4
Social Influence		
One Concept(social support & injunctive norm)	189.98	19
One Concept(social support & descriptive norm)	251.39	19
Three Concepts*	25.51	17
One Concept (social support and subjective norm)	421.59	20
Two concepts *	295.13	19
PBC		
One Concept		
Two Concepts*	47.81	9
	10.95	8

* = $p<.05$

Next, results of the unitary concept model (i.e., commonality model) versus component concept model (i.e., specificity model) analyses are presented for study 1 in Table 3.3 and for study 2 in Table 3.4. For both study 1 and 2, no significant difference ($p>.05$) was found between the specificity and commonality models of subjective norm. This suggests that injunctive and descriptive norm act on behavioral intention in a unitary fashion respectively. In contrast, the specificity model for social influence concepts of

subjective norm and social support fit the data significantly better than the commonality model for study 1[χ^2 (1) difference = 4.06, p<.05], but was not significantly different for study 2. Study 1 found social support did not have a significant effect upon exercise intention (t=-1.32, P>.05). Also this effect showed signs model mispecification as it had a negative effect estimate, yet possessed a positive correlation with intention (.23). A negative coefficient like this is likely a sign of either suppression, an estimation anomaly, or an incorrectly estimated effect in causal sequencing (Hayduk, 1989; Bollen, 1989). Subjective norm in study 1 did have a significant effect (t=3.73, p<.05) upon intention. Therefore, the specificity of subjective norm and not the variance commonality of social influence predicted exercise intention in study 1, while subjective norm and social support acted on behavioral intention as a unitary social influence concept in study 2.

Converse to social influence, the specificity model for concepts of affective and instrumental attitude in study 2 fit the data significantly better than the commonality model [χ^2 (1) difference = 11.67, p<.05], while not significantly different for study 1. Study 2 found instrumental attitude did not have a significant effect upon exercise intention (t=0.17, P>.05). In contrast, affective attitude did have a significant effect (t=4.04, p<.05). Therefore, the specificity of affective attitude and not the scale variance commonality of attitude predicted exercise intention in study 2, while attitude acted as a unitary concept on intention in study 1.

Finally, the specificity model for volitional control and self-efficacy fit the data significantly better than the unitary PBC concept model for the prediction of intention in both study 1[χ^2 (1) difference = 51.83, p<.01] and study 2[χ^2 (1) difference = 10.47, p<.05]. The model found volitional control to have a negative estimated effect (study 1: t

=-3.23, study 2: t=-0.88) when the bivariate correlation with intention was positive. Again, this suggests either suppression, an estimation anomaly due to the high correlation between self-efficacy and volitional control concepts, or a mispecified model from an incorrectly estimated effect in causal sequencing. In contrast, self-efficacy had a significant positive effect upon intention (study 1: t=7.88, p<.05; study 2: t=3.73, p<.05). For study 1, both the commonality model and the specificity model did not have a significant effect (p<.05) on exercise behavior while controlling for intention. However, for study 2, the specificity model for volitional control and self-efficacy fit the data significantly better than the unitary PBC concept model for the prediction of behavior [χ^2 (1) difference = 3.98, p<.05]. The model found volitional control to have a nonsignificant negative polarity estimated effect (t=-1.56, p>.05) when the bivariate correlation with behavior was positive, again suggesting some form of model mispecification. In contrast, self-efficacy had a significant positive effect upon behavior (t=2.46, p<.05).

TABLE 3.3 COMMONALITY SCALE MODEL VERSUS SPECIFICITY COMPONENT MODELS FOR UNDERGRADUATES

Model (N=300)	χ^2	DF
Scale Model	356.16	205
Specificity Models		
Affective and Instrumental attitude	355.85	204
Social Support and subjective norm*	352.10	204
Step 2: Injunctive and descriptive norm	350.17	203
Self-efficacy and volitional control on intention*	304.33	204
Self-efficacy and volitional control on behavior	355.30	204

* = p<.05.

TABLE 3.4 COMMONALITY SCALE MODEL VERSUS SPECIFICITY COMPONENT MODELS FOR CANCER SURVIVORS

Model (N=272)	χ^2	DF
Scale Model	316.99	205
Speeificity Models		
Affective and Instrumental attitude*	305.32	204
Social Support and subjective norm	316.94	204
Step 2: Injunctive and descriptive norm	316.44	203
Self-efficacy and volitional control on intention*	306.52	204
Self-efficacy and volitional control on behavior*	313.01	204

* = $p<.05$.

Model of Conceived Relationships between Theory of Planned Behavior Components

The results of the previous attitude, social influence, and PBC analysis for both studies were combined with our conception of the relationships of the TPB components. The models were moderately acceptable for both study 1[$\chi^2(205, N=300) = 319.34$, $p<.01$, RMSEA = .043, CFI =.96] and study 2 [$\chi^2(204, N=272) = 300.86$, $p<.01$, RMSEA = .042, CFI =.96]. Despite the failing χ^2, standardized residuals and modification indices did not suggest any changes would significantly improve model fit. Therefore, the models simply appear to suffer from general minor miss-fit across the fixed parameters. Tables 3.5 and 3.6 present the measurement model, Tables 3.7 and 3.8 present the correlated structural disturbance terms, and Figure 3.2 and 3.3 highlight the structural effects for study 1 and 2 respectively. For both studies, the measurement model was significant for all factor loadings and of large magnitude (.94-.53).

TABLE 3.5 MEASUREMENT MODEL OF TPB FOR UNDERGRADUATES (N=300). All loadings significant p<.05.

	Mean	SD	Factor Loading	Error Variance
ATTITUDE				
Affective				
Enjoyable/unenjoyable	5.29	1.52	.76	.42
Interesting/boring	4.89	1.43	.75	.44
Relaxing/stressful	5.05	1.41	.57	.68
Instrumental				
Useful/useless	6.23	0.86	.81	.33
Wise/foolish	6.30	0.78	.66	.56
Beneficial/harmful	6.41	0.84	.71	.50
SUBJECTIVE NORM				
Injunctive Norm				
"want me to exercise"	5.21	1.38	.73	.47
"approve if I exercised"	6.33	1.03	.62	.61
Descriptive Norm				
Friends exercise	4.40	1.69	.72	.48
Family exercise	3.92	1.86	.53	.72
Co-Workers exercise	3.92	1.47	.55	.70
SOCIAL SUPPORT				
"likely to help me exercise"	4.48	1.91	.79	.38
"turn to for assistance with exercise"	5.64	1.66	.76	.43
"provide the support I need in order to exercise"	5.14	1.76	.79	.37
SELF-EFFICACY				
Confidence	5.42	1.75	.94	.11
Barrier	5.19	1.47	.67	.54
Ability	6.10	1.31	.76	.42
VOLITIONAL CONTROL				
"entirely up to me"	6.15	1.38	.63	.61
"personal control"	6.04	1.28	.89	.21
"beyond your control"	5.42	1.80	.77	.41

INTENTION				
INT1	4.52	1.36	.93	.14
INT2	3.23	1.48	.84	.30
EXERCISE				
Strenuous	1.95	2.00	.77	.40

TABLE 3.6 CORRELATED STRUCTURAL DISTURBANCE TERMS FOR UNDERGRADUATES

	Affective Attitude	Instrumental Attitude	Injunctive Norm	Descriptive Norm	Self-efficacy
Instrumental Attitude	.61*				
Injunctive Norm	.18*	.38*			
Disjunctive Norm	.26*	.23*	.54*		
Social Support	.17*	.12*	.41*	.55*	
Self-Efficacy	.59*	.47*	.22*	.28*	
Volitional Control	.30*	.24*	.11*	.08	.50*

* = P<.05 one-tailed.

TABLE 3.7 MEASUREMENT MODEL OF TPB FOR CANCER SURVIVORS
(N=272) All loadings significant p<.05.

	Mean	SD	Factor Loading	Error Variance
ATTITUDE				
Affective				
Enjoyable/unenjoyable	4.87	1.64	.87	.24
Interesting/boring	4.80	1.52	.70	.51
Relaxing/stressful	5.08	1.43	.73	.47
Instrumental				
Useful/useless	5.91	1.27	.91	.17
Wise/foolish	6.18	0.98	.82	.33
Beneficial/harmful	6.01	1.09	.89	.20
SUBJECTIVE NORM				
Injunctive Norm				
"want me to exercise"	5.31	1.56	.91	.17
"approve if I exercised"	5.97	1.26	.79	.38
Descriptive Norm				
Friends exercise	3.94	1.70	.85	.28
Family exercise	4.12	1.99	.65	.58
Co-Workers exercise	3.80	1.63	.83	.31
SOCIAL SUPPORT				
"likely to help me exercise"	3.71	2.10	.86	.27
"turn to for assistance with exercise"	4.73	2.05	.53	.72
"provide the support I need in order to exercise"	4.48	2.01	.70	.50
SELF-EFFICACY				
Confidence	5.03	1.91	.66	.57
Barrier	5.35	1.56	.77	.41
Ability	6.00	1.42	.86	.26
VOLITIONAL CONTROL				
"entirely up to me"	6.22	1.36	.61	.63
"personal control"	6.16	1.34	.85	.27
"beyond your control"	5.40	1.98	.65	.58

INTENTION				
INT1	4.84	1.70	.97	.06
INT2	3.73	1.95	.85	.27
EXERCISE				
Strenuous + Moderate	2.42	2.83	.77	.40

TABLE 3.8 CORRELATED STRUCTURAL DISTURBANCE TERMS FOR CANCER SURVIVORS

	Affective Attitude	Instrumental Attitude	Injunctive Norm	Descriptive Norm	Self-efficacy
Instrumental Attitude	.59*				
Injunctive Norm	.23*	.30*			
Disjunctive Norm	.23*	.12*	.36*		
Social Support	.20*	.11*	.45*	.30*	
Self-Efficacy	.37*	.42*	.28*	.05	
Volitional Control	.24*	.41*	.25*	.06	.81*

* = P<.05 one-tailed.

All structural effects in this trimmed model except self-efficacy upon exercise behavior for study 1, and social support upon volitional control and instrumental attitude upon intention for study 2 were significant ($p<.05$). Specifically, for study 1, affective

and instrumental attitude and injunctive and descriptive norm had nearly identical effects of .56 and .57 upon the attitude and subjective norm concepts respectively. Further, although social support was identified as not possessing a direct relationship with intention, it had effects upon both volitional control (.21) and self-efficacy (.33). Finally, attitude, subjective norm, and self-efficacy had standardized effects of .27, .10, and .55 upon intention explaining 64% of its variance, while intention had an effect of .79 on behavior explaining 74% of its variance.

For study 2, injunctive and descriptive norm had slightly different effects upon the subjective norm scale of .71 and .50 respectively. Further, subjective norm (.76) and social support (.38) had effects of different magnitude upon a general social influence concept, while social support had an effect of .28 upon self-efficacy. Finally, affective attitude, social influence, and self-efficacy all had standardized effects of .24, .10, and .47 upon intention explaining 44% of its variance freed of measurement error, while intention and self-efficacy had effects of .46 and .19 on behavior respectively, explaining 36% of its variance freed of measurement error.

However, given the cross-sectional design of study 2, causal interpretation may be limited if change in behavior had occurred across two-weeks.

FIGURE 3.2 THEORY OF PLANNED BEHAVIOR MODEL AMONG UNDERGRADUATES TO PREDICT EXERCISE BEHAVIOR

Note: All effects are standardized; ⟶ = p<.05 one-tailed, ⇢ = p>.05 one-tailed.

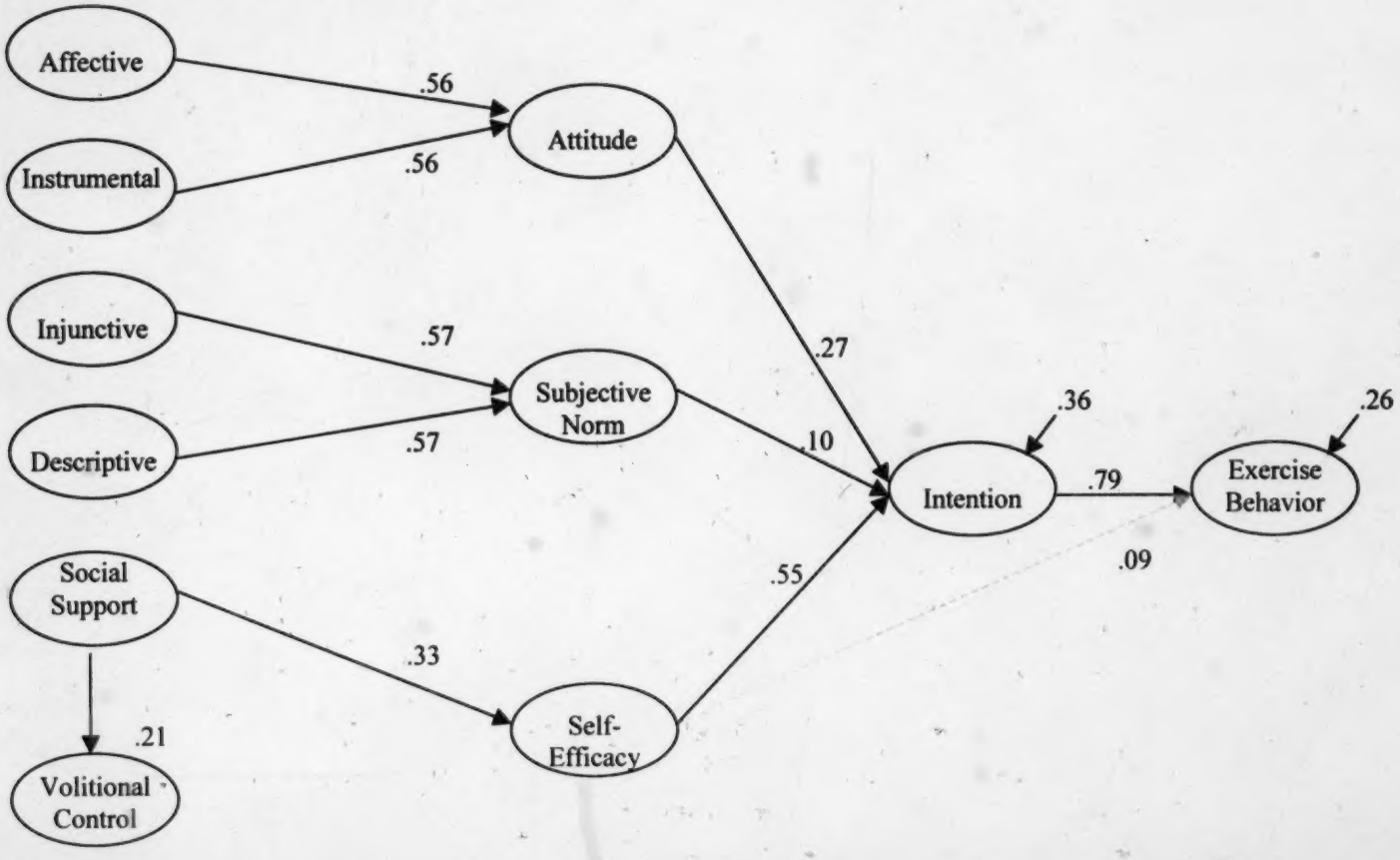
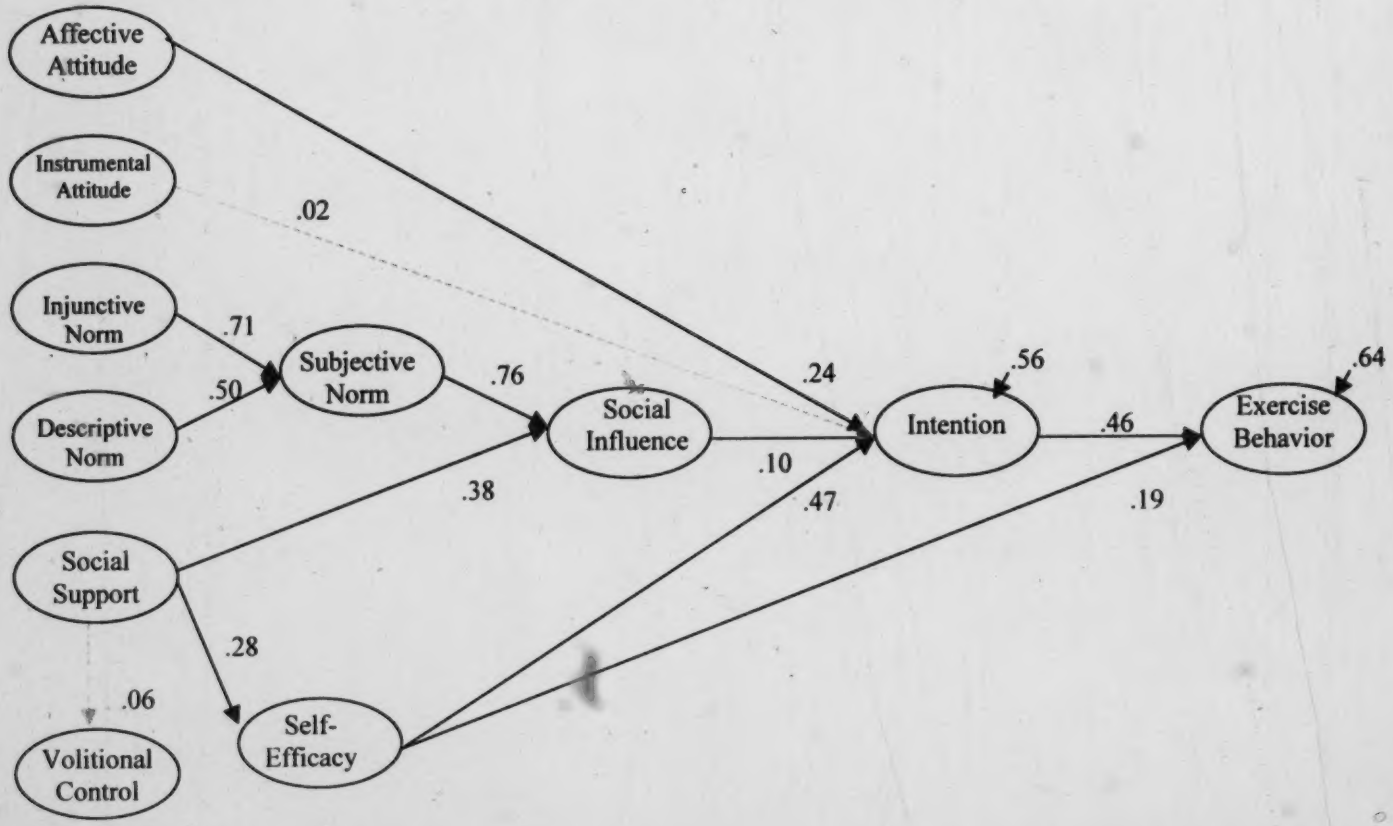


FIGURE 3.3 THEORY OF PLANNED BEHAVIOR MODEL AMONG CANCER SURVIVORS TO PREDICT EXERCISE BEHAVIOR

Note: All effects are standardized; ⟶ = p<.05 one-tailed, ⇢ = p>.05 one-tailed.



Discussion

Study 1 focused on a convenience sample of young, healthy adults to examine whether the multiple components of attitude, social influence, and perceived behavioral control act as unitary constructs, or whether their specificity is responsible for the prediction of exercise intention and behavior. Further an original conceptualization of the theory of planned behavior model with the inclusion of all these components was examined. Study 2 attempted to replicate these findings on a sample of cancer survivors. The results, from a comparison of these two populations, suggest that all concepts possessed discriminant validity indicating support for measurement invariance of these concepts. However, different optimal commonality scales and specificity models for attitude, social influence, and PBC have significant influence upon exercise intention, suggesting distinct tailored interventions and alternative conceptualizations may be most beneficial.

In respect to exercise attitude, the results from the undergraduate sample (study 1) suggested that both affective and instrumental components act upon exercise intention in a unitary fashion which had a significant effect when controlling for other TPB concepts. This finding suggests that previous TPB exercise research measuring attitude as a summed scale of affective and instrumental concepts among young adults may accurately capture the relevant variance for prediction of intention. From a tailored intervention perspective, this also suggests that both instrumental and affective beliefs can be targeted for successful change of exercise intentions.

In contrast, only affective attitude had a significant influence upon intention among cancer survivors. This suggests that some previous TPB research in the exercise

domain that utilized affective and instrumental concepts as a summed scale may not have represented attitude conceptualization optimally, especially previous research among cancer survivors (Courneya, & Friedenreich, 1997, 1999; Courneya, Friedenreich, Authur, & Bobick, 1999). From a tailored intervention perspective, this also suggests that underlying affective beliefs may need to be targeted for successful change of exercise intentions. Since current TPB beliefs measured in the exercise domain underlie primarily the instrumental attitude concept, future research is required to generate affective beliefs and rectify this current measurement paucity for guidance in tailored interventions

Possible reasons for this difference between the attitude components among the undergraduate students and cancer survivors may be due to age discrepancies and/or from the cancer experience, since attitude means, variabilities, and inter-concept correlations are comparable. For example, over time, as one gets older, the affect associated with regular exercise (e.g., whether it is enjoyable, whether it is interesting) may differentiate whether one intends to exercise or not more than their instrumental beliefs. Also, perhaps the psychological effects from the cancer experience and/or physical impairments as a result of cancer treatment may amplify the importance of the affective component for exercise intention. Certainly more research is warranted to explore the underlying beliefs of affective attitude among this population.

In contrast to exercise attitude, both injunctive and descriptive norm acted in a unitary fashion towards the prediction of intention among both samples. From a practical perspective, this suggests that both these concepts can be modeled together to represent subjective norm. From a conceptual perspective, this provides evidence for our

hypothesis that both injunctive and descriptive norm represent significant components of overall perceived pressure.

However, the unitary influence of both subjective norm and social support upon intention had a discrepant finding between the two samples. Specifically, subjective norm and not social support acted as a solitary influence upon intention for undergraduates, while both social support and subjective norm acted as influential components of an overall social influence concept for cancer survivors. This difference may result from social support being an important component of regular exercise behavior among older adults, as reported in recent studies (Rhodes et al., 1999). Further, younger adults may not require as much social support, but be more reliant and persuaded by what others think and do. Still, the larger effect of subjective norm (.76) over social support (.38) in study 2 suggests their social influence is not equal for predicting intentions. This ambiguity of the relative influence of subjective norm and social support for predicting intentions in the exercise domain is consistent with the current exercise behavior literature (Courneya, & McAuley, 1995, Courneya, Plotnikoff et al, 2000, Rhodes, et al., 2001), and may be the result of differences in social support measures, or the addition of disjunctive norm to the concept of subjective norm. Certainly more research is required before this finding can be generalized.

Moreover, the construct of subjective norm has not performed well in explaining exercise intentions across studies when controlling for attitude and PBC, typically being either non-significant or of small significant magnitude (Godin & Kok, 1996). These studies also identify that although concepts of social influence are significant, their magnitude of influence on intention is much smaller than attitude and self-efficacy/PBC.

Although social support did not seem to be an important influence on intention directly in either study, it had a significant influence upon self-efficacy in both samples, and on volitional control in study 1. This suggests the importance of social support for possible interventions to increase self-efficacy and is in agreement with previous exercise research (Duncan & McAuley, 1993) and theorizing by Bandura (1986).

As hypothesized, self-efficacy, rather than volitional control, had a significant effect on intention among undergraduates and cancer survivors alike, supporting previous research investigating the two concepts in the TPB (Armitage & Conner, 1999a, 1999b; Armitage et al., 1999; Manstead & Van Eekelen, 1998; Povey et al., 2000; Sparks, Guthrie, & Shepherd, 1997; Terry & O'Leary, 1995). Also, controllability's items of "control" had higher factor loadings than the "up to me" item. This lends support for our hypothesis that "control" items may tap more self-efficacy-related variance than "up to me" items and therefore be more predictive.

Ajzen's (2001) suggested unitary construct of PBC was not found to fit the data as well as a specificity model for self-efficacy. This suggests that self-efficacy, not volitional control or their respective variance commonality, is the best predictor of intention. Still, the relationship between self-efficacy and volitional control remains poorly conceptualized. Further, although self-efficacy appears to be the better predictor of intentions, the two concepts are likely to be mutually causative. For example, individuals are likely to take their volitional control into account when forming self-efficacy appraisals, but confidence to perform a behavior should also influence one's perception of volitional control over the behavior. Certainly more theory-driven research into the hypothesized similar and differential influences of each concept is recommended.

From a practical position, the strong evidence for self-efficacy as a predictor of intention clearly underscores the motivational influences of self-efficacy, the importance of self-efficacy tailored exercise interventions, and the prominence of understanding relevant efficacy beliefs.

Finally, study 1 suggested that neither self-efficacy or volitional control had a direct effect on exercise behavior. In contrast, study 2 found self-efficacy, not volitional control or a unitary PBC concept to influence behavior. However, the findings of study 2 must be considered with caution given the cross-sectional design.

The disparities between the two samples in the optimal conceptualizations of these TPB concepts underscores the importance of examining multiple populations for the most precise understanding of social-cognitive influences on any health behavior. Any of these differences are likely to have direct and meaningful implications for orchestrating the most effective intervention programs.

CHAPTER 4: RESULTS AND DISCUSSION FOR PURPOSE 2

Results

Specific Analyses Procedures

Given the hypothesized domain representativeness and relevance of the single item intention item, this indicator was given a fixed error variance of 10%. For the analysis, a sequential step-wise procedure was implemented for model parsimony. First, all FFM concepts were modeled with potential effects upon exercise behavior. The facet scales provided by Saucier (1998) were utilized as indicators and the FFM concepts at the structural level were freed to correlate based on research questioning the orthogonality of the FFM (Church & Burke, 1994; Rhodes et al., 2001; Silva et al., 1994). Next, any FFM concept with a significant effect upon exercise behavior was modeled using the proposed second order structure of the personality trait (Costa & McCrae, 1995) and the facet structure proposed by Saucier (1998). This procedure divides variance of the observed personality measures into 1) variance resulting from the general latent concept, 2) variance resulting from the unique aspects of the latent facets, and 3) variance resulting from measurement error. The second order concept's variance was fixed at 1.0 for estimation of the loadings of its respective latent facets. Finally, any personality trait from the facet/general domain analysis with a significant effect upon exercise behavior was subsequently included in the TPB model and freed upon all TPB concepts and exercise behavior.

Investigating personality and Exercise Behavior

The model investigating the FFM and exercise behavior suggested a moderately poor fit of the data for both study 1 (χ^2 [76, N=303] = 242.37, $p<.001$, CFI = .85,

RMSEA = .09) and study 2 (χ^2 [76, N=299] = 296.13, p<.001, CFI = .81, RMSEA = .10). Modification indices and standardized residuals suggested a scattered assortment of multiple changes in the measurement model of the FFM that would significantly improve the model fit, but potentially capitalize on chance fluctuations within the sample data sets. The poor fit of the NEO-FFI has been reported and addressed in previous research utilizing structural equation modeling (Tokar, Fischer, Snell, & Harik-Williams, 1999) and is a consequence of measuring abstract personality concepts with an overly-stringent or improper structure. Despite the poor model fit in both studies, the concept loadings were all significant (p<.05) except for the unconventionality indicator for O in study 1 (see Table 4.1). This item cluster was also the least reliable in the original research developing these NEO-FFI facet traits (Saucier, 1998) and suggests that unconventionality as presently measured is a poor indicator of openness to experience. The structural effects for both studies are presented in Figure 4.1. Only E had a significant effect (p<.05) upon exercise behavior of .28 and .22 for study 1 and study 2 respectively. Several large and significant (p<.05) correlations were estimated among the FFM concepts, but only E displayed significant effects on exercise and was carried forward to the next step of the analysis.

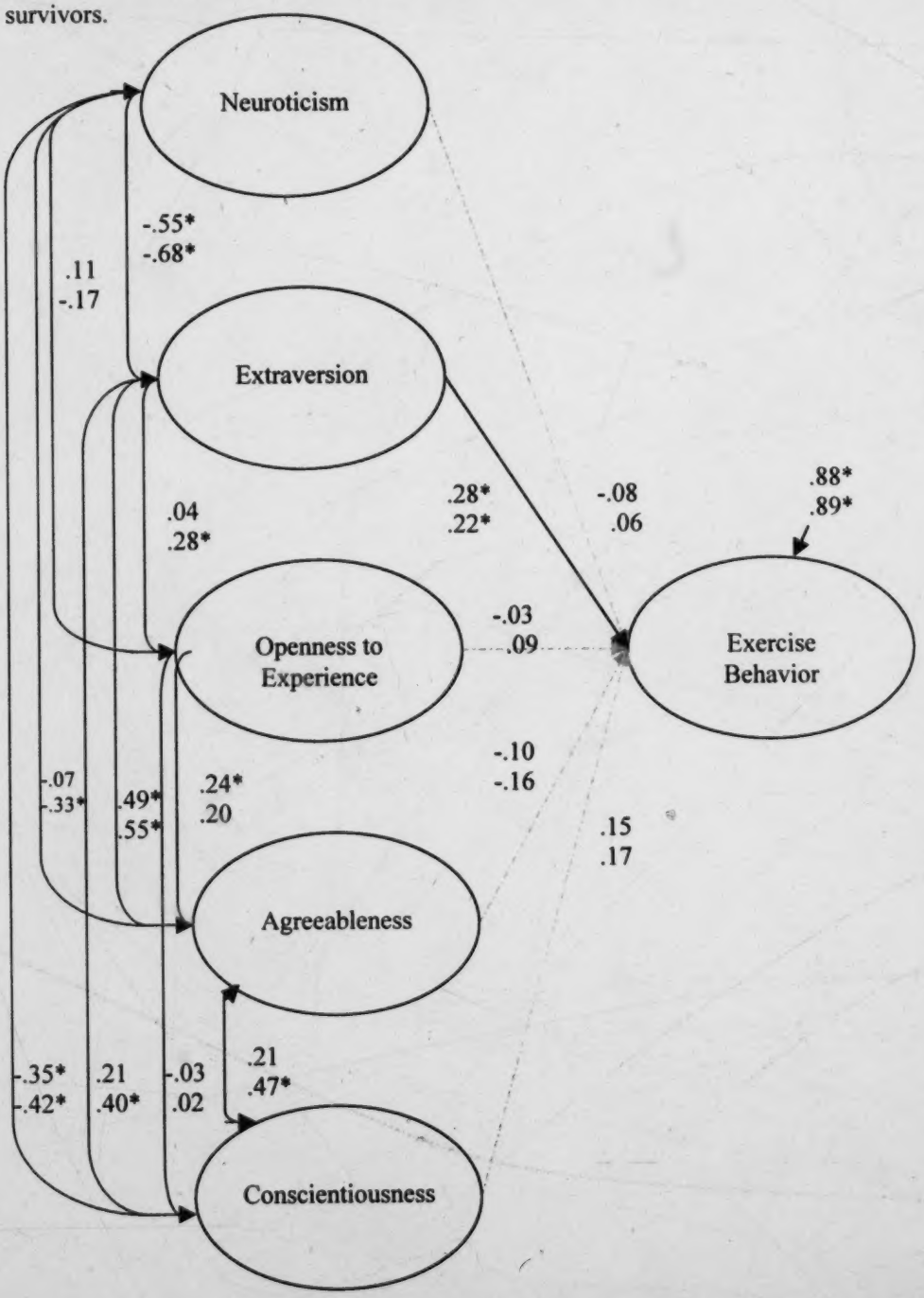
TABLE 4.1 FACTOR LOADINGS FOR THE FIVE FACTOR MODEL OF PERSONALITY AND EXERCISE BEHAVIOR AMONG UNDERGRADUATE STUDENTS AND CANCER SURVIVORS

	Mean		SD		Factor Loading		Error Variance	
	US	CS	US	CS	US	CS	US	CS
Neuroticism								
Anxiety	2.11	1.77	0.75	0.83	.71	.77	.49	.41
Depression	1.97	1.57	0.85	0.80	.83	.84	.32	.30
Self-Reproach	1.79	1.40	0.81	0.82	.77	.72	.41	.47
Extraversion								
Positive Affect	2.70	2.59	0.61	0.68	.74	.73	.45	.47
Sociability	2.45	2.23	0.67	0.64	.61	.49	.62	.76
Activity	2.60	2.14	0.64	0.69	.61	.44	.63	.80
Openness								
Aesthetic Interests	2.35	2.25	0.99	0.85	1.00	.71	.00	.49
Intellectual Interests	2.76	2.34	0.74	0.69	.41	.57	.83	.67
Unconventionality	2.20	1.81	0.55	0.58	.12*	.26	.99	.93
Agreeableness								
Nonantagonistic	2.33	2.67	0.59	0.53	.87	.89	.25	.21
Prosocial Orientation	3.26	3.26	0.50	0.45	.57	.56	.67	.69
Conscientiousness								
Orderliness	2.35	2.82	0.71	0.62	.71	.67	.50	.55
Goal Striving	2.94	2.82	0.68	0.68	.79	.73	.37	.46
Dependability	2.93	3.15	0.58	0.52	.74	.78	.46	.39
Exercise Behavior	1.95	2.42	2.00	2.83	.77	.77	.40	.40

Note: * = $p>.05$; All loadings $p<.05$ otherwise. US = Undergraduate students; CS = cancer survivors.

FIGURE 4.1 EFFECTS OF THE FFM OF PERSONALITY UPON EXERCISE BEHAVIOR

Note: All effects are standardized; * = p<.05. Top = Undergraduates; Bottom = Cancer survivors.



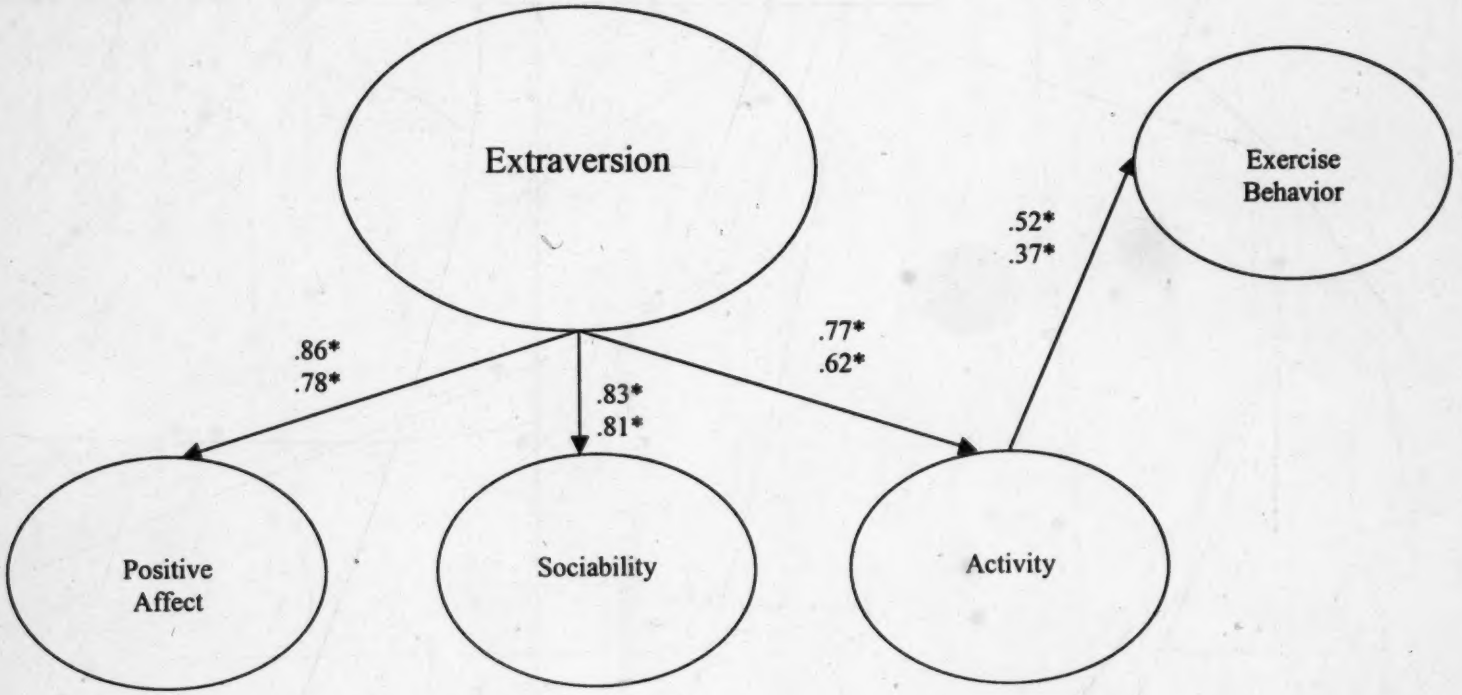
Given that only E had the significant effect upon exercise behavior for both undergraduates and cancer survivors, the next analysis modeled only E and its facets of positive affect, sociability, and activity as latent concepts. It was hypothesized that activity would have the significant effect upon exercise behavior and therefore this effect was freed in the model. This model again suggested a poor fit of the data for both study 1 (χ^2 [62, N=303] = 158.92, p<.001, CFI = .88, RMSEA = .07) and study 2 (χ^2 [62, N=296] = 190.07, p<.001, CFI = .80, RMSEA = .08). Modification indices and standardized residuals again suggested a scattered assortment of multiple changes in the measurement model of E that would significantly improve the model fit, but potentially capitalize on chance with the sample data sets. However, no significant changes were suggested for the structural effects upon exercise behavior. Specifically, no effect from E itself, or from sociability or positive affect would have improved the fit to the data. Table 4.2 details the means and standard deviations for the indicators as well as the factor loadings and error variances for the model. All loadings for the latent concepts were statistically significant (p<.05), but many factor loadings are of small magnitude. Further the structural model (see Figure 4.2) found all loadings on the second order E concept significant (p<.05) for both studies. Finally, both study 1 and study 2 found the effect of activity upon exercise behavior significant (p<.05) with standardized effects of .50 and .37 respectively. This suggests that it is the specific variance of activity and not the common variance of E or specific variances of positive affect and sociability that is responsible for the effect of personality upon exercise behavior.

TABLE 4.2 FACTOR LOADINGS FOR THE EXTRAVERSION AND EXERCISE BEHAVIOR AMONG UNDERGRADUATE STUDENTS AND CANCER SURVIVORS

	Mean		SD		Factor Loading		Error Variance	
	US	CS	US	CS	US	CS	US	CS
Extraversion								
Positive Affect								
#7	3.18	2.98	0.79	0.87	.36	.53	.87	.72
#12	2.30	2.09	0.94	0.99	.34	.42	.89	.83
#37	2.78	2.64	0.80	0.86	.83	.84	.30	.29
#42	2.55	2.60	0.96	0.99	.71	.57	.49	.68
Sociability								
#2	2.51	2.05	0.95	1.03	.63	.63	.61	.60
#17	3.21	3.17	0.77	0.76	.70	.67	.51	.55
#27	1.92	1.91	1.02	1.05	.56	.37	.68	.86
#57	2.16	1.80	1.08	1.09	.38	.25	.86	.94
Activity								
#22	2.65	2.23	0.85	0.95	.47	.35	.78	.87
#32	2.26	1.83	0.96	0.98	.62	.59	.61	.66
#47	2.74	1.93	0.87	1.15	.44	.46	.81	.79
#52	2.76	2.58	1.01	0.97	.70	.74	.51	.45
Exercise Behavior	1.95	2.42	2.00	2.83	.77	.77	.40	.40

Note: All loadings $p<.05$. US = Undergraduate students; CS = cancer survivors.

FIGURE 4.2 EFFECT OF EXTRAVERSION'S ACTIVITY FACET UPON EXERCISE BEHAVIOR
Note: All effects are standardized; * = p<.05. Top = Undergraduates; Bottom = Cancer survivors



Investigating Personality, the Theory of Planned Behavior and Exercise

The final model included only the activity trait freed upon concepts of the TPB and exercise behavior to account for direct and indirect effects of activity. This model suggested a moderately good fit of the data for both study 1 (χ^2 [160, N=302] = 223.73, $p<.05$, CFI = .97, RMSEA = .04) and study 2 (χ^2 [160, N=276] = 275.74, $p<.05$, CFI = .95, RMSEA = .05). Further, the modification indices and standardized residuals suggested minimal changes that would significantly improve the model fit, supporting that the effects within the model can be interpreted with moderate confidence. Table 4.3 details the means and standard deviations for the indicators as well as the factor loadings and error variances for both study 1 and study 2. All loadings for the latent concepts were statistically significant ($p<.05$). Further, no correlated structural disturbance terms for all TPB concepts exceeded a standardized effect of .40, suggesting concept distinctness in both models. Figure 4.3 details the structural effects of the model. Specifically, activity had a significant effect ($p<.05$) upon all concepts in the model including exercise behavior (study 1 = .25; study 2 = .35) while controlling for both intention and self-efficacy. Taken together, 33% and 63% of the variance in intention and 43% and 35% of the variance in exercise behavior were explained by study 1 and study 2 respectively.

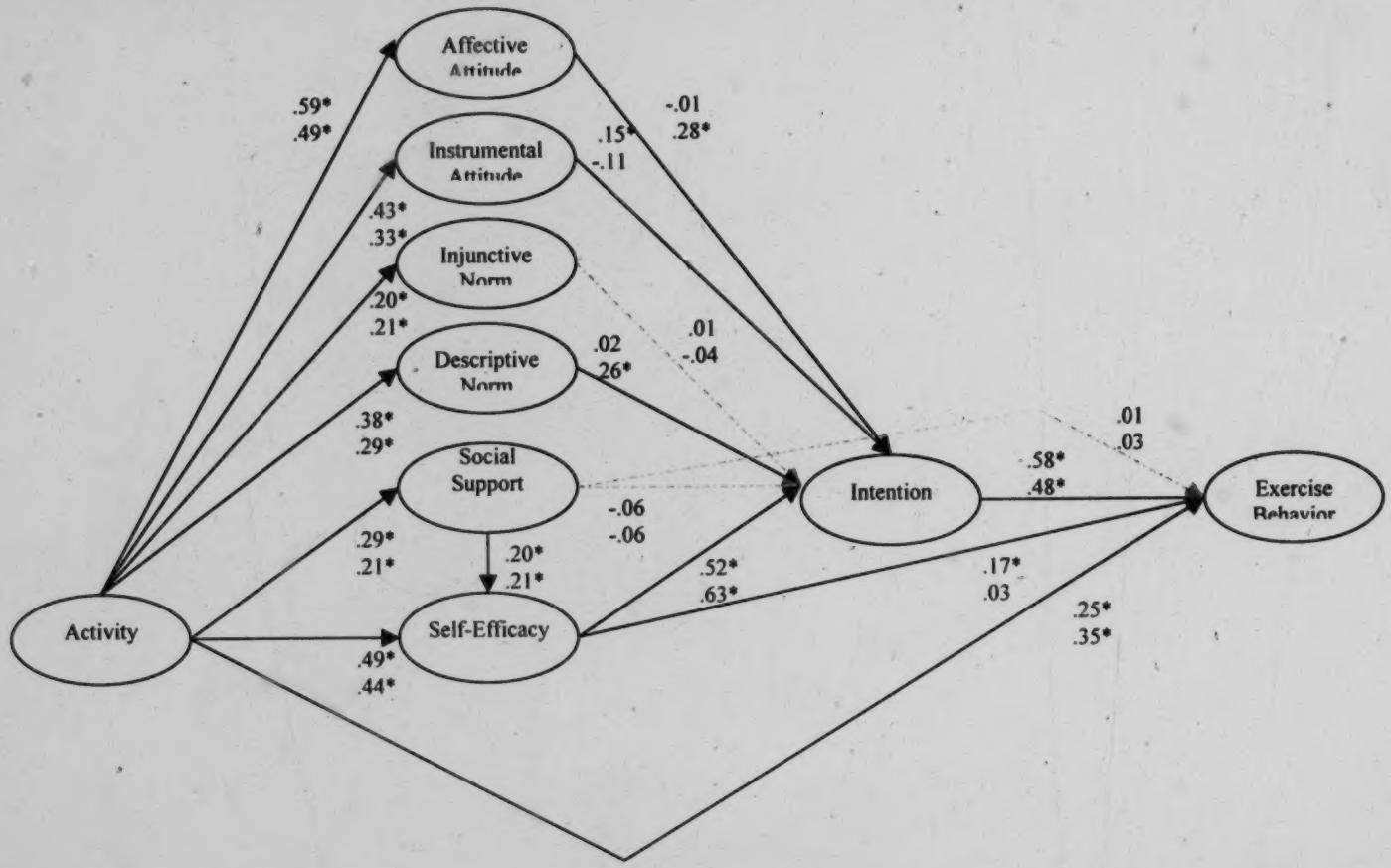
TABLE 4.3 FACTOR LOADINGS FOR ACTIVITY, THE THEORY OF PLANNED BEHAVIOR AND EXERCISE AMONG UNDERGRADUATE STUDENTS AND CANCER SURVIVORS

	Mean		SD		Factor Loading		Error Variance	
	US	CS	US	CS	US	CS	US	CS
Activity								
#22	2.65	2.23	0.85	0.95	.34	.30	.89	.91
#32	2.26	1.83	0.96	0.98	.42	.63	.82	.60
#47	2.74	1.93	0.87	1.15	.36	.42	.87	.83
#52	2.76	2.58	1.01	0.97	.94	.72	.11	.49
Affective Attitude								
Enjoyable	5.29	4.87	1.52	1.64	.75	.86	.43	.26
Interesting	4.89	4.80	1.43	1.52	.75	.70	.44	.51
Relaxing	5.05	5.08	1.41	1.43	.58	.74	.67	.45
Instrumental Attitude								
Useful	6.23	5.91	0.86	1.27	.82	.91	.32	.17
Wise	6.30	6.18	0.78	0.97	.66	.82	.56	.33
Beneficial	6.41	6.01	0.84	1.09	.70	.89	.51	.21
Injunctive Norm								
"want"	5.21	5.31	1.38	1.56	.75	.90	.43	.20
"approve"	6.33	5.97	1.03	1.25	.60	.80	.64	.36
Descriptive Norm								
Friends exercise	4.40	3.94	1.69	1.70	.75	.76	.44	.42
Family exercise	3.92	4.12	1.86	1.99	.48	.68	.77	.54
Social Support								
"help me exercise"	4.48	3.71	1.91	2.10	.90	.80	.20	.36
"provide support"	5.14	4.48	1.76	2.01	.69	.75	.53	.44
Self-Efficacy								
Confidence	5.42	5.02	1.75	1.91	.95	.66	.10	.57
Barrier	5.19	5.35	1.47	1.55	.66	.74	.56	.46
Ability	6.10	6.00	1.31	1.42	.76	.88	.43	.22
Intention	4.52	3.73	1.36	1.95	.95	.95	.10	.10
Exercise Behavior	1.95	2.42	2.00	2.83	.77	.77	.40	.40

Note: All loadings $p<.05$. US = Undergraduate students; CS = cancer survivors.

FIGURE 4.3 EFFECT OF EXTRAVERSION' S ACTIVITY FACET UPON THE THEORY OF PLANNED BEHAVIOR AND EXERCISE BEHAVIOR

Note: All effects are standardized; * = p<.05 one-tailed. Top = Undergraduate students; Bottom = Cancer survivors.



Discussion

Purpose 2 of this dissertation investigated the mediating hypothesis between personality, exercise, and an extended TPB model including concepts of affective and instrumental attitude, injunctive and descriptive norm, social support, and self-efficacy on two pupolation samples. These models were tested using a structural equation modeling analysis that estimated the concepts free of measurement error and allow for a test of omnibus model fit.

It was hypothesized that E's activity facet would have a significant direct effect upon exercise behavior while controlling for the TPB based on the presupposition that activity may represent a disposition that predicts exercise behavior free of conscious control (Courneya et al., 1999; Rhodes et al., 2001).

First, however, the complete FFM was examined for effects upon exercise behavior and only E had a significant effect ($p<.05$) for both undergraduate students and cancer survivor samples. This finding supports the previous research with personality and the TPB (Courneya et al., 1999; Rhodes et al., 2001), and suggests that an individuals placement on the E continuum influences one's level of exercise behavior. As argued previously, extraverts likely have a predisposition towards seeking activities like regular exercise (Courneya et al., 1999).

Given that only E had a significant effect upon exercise behavior, the next analysis modeled only E and its facets of positive affect, sociability, and activity as latent concepts. Both studies found the effect of activity upon exercise behavior significant as hypothesized, suggesting that it is the specific variance of activity, and not the common variance of E or specific variances of positive affect and sociability, that is responsible

for the effect of personality upon exercise behavior. This is in agreement with initial hypothesis, and replicates the earlier findings of Rhodes et al. (2000), that activity is the key component of extraversion with an influence upon exercise behavior. Given that those individuals high on activity are energetic, and prefer busy and active lives, exercise appears to be a likely behavior for these individuals to seek.

The final model included effects of the activity trait freed upon the TPB and exercise behavior. The key finding was that activity had a significant effect ($p<.05$) upon all concepts in the model including exercise behavior (study 1 = .25; study 2 = .35) while controlling for both intention and self-efficacy. This supports robustness of the original findings of Rhodes et al. (2001), suggesting the importance of the activity trait in exercise behavior prediction even when using an extended TPB model and disparate population samples.

As intention is the proximal determinant of volitional behavior (Ajzen, 1991), the personality trait of activity may account for prediction of exercise behavior beyond planned volition. The TPB tries to predict incompletely volitional behaviors by incorporating perceived control (i.e., self-efficacy) as a predictor of behavior (Ajzen, 1988; Ajzen, 1991). However, self-efficacy was not statistically significant upon behavior in study 2 and had a smaller significant effect upon exercise behavior than activity in study 1. As mentioned previously, the activity facet describes people who often keep busy, act vigorously, talk rapidly, and are energetic and forceful (McCrae & Costa, 1990). By this description, active individuals may engage in exercise behavior beyond their planned intention because they frequently seek situations where the opportunity to be active presents itself. In contrast, individuals less disposed to general

activity would experience fewer opportunities than their active counterparts to exercise beyond their planned exercise behavior.

Alternatively, social-cognitions may always precede behavior, as theoretically surmised (Ajzen, 1991), but lack the temporal stability in measurement to mediate more stable predictors. Temporal stability is a principle limitation outlined in the TPB (Ajzen, 2000), and exercise intentions have demonstrated to be unstable even over two-day durations (Courneya & McAuley, 1993). Therefore, personality may not pose a theoretical threat to the TPB but add predictive value because of greater temporal stability. Moreover, extending the TPB further, with even more social-cognitive concepts, is unlikely to account for the effects of personality on behavior because of this temporal stability limitation.

Though this suggests that the addition of personality to the TPB has little theoretical value, the practical significance may be paramount. Exercise researchers are generally interested in predicting future behavior as accurately as possible so as to deliver useful interventions. If social-cognitions fluctuate while personality is a very stable predictor, interventions will likely benefit from consideration of one's personality along with social-cognitions. Consequently, a practical implication of this research may be that personality needs to be taken into account when developing exercise interventions rather than assuming that targeting social cognitions will subsume these differences. For example, individuals with positive social cognitions but lower on activity may require special intervention efforts to increase the antecedents of behavioral intention. In comparison, individuals higher on activity should benefit from TPB based interventions, but are also more likely to exercise beyond these efforts.

A third possibility for the relationship between activity and exercise behavior may be a statistical artifact of measurement. The principle item for activity (#52) in the NEO-FFI is a description of one's general activity. This item is not specifically exercise related, but if interpretation of the item is all inclusive of physical activity, the activity trait may be related to exercise behavior simply through self-description. However, this is unlikely, given the broad and general phrasing of the item. Further, I theorize that individuals high in E's facet of activity may often manifest this drive through regular exercise behavior. Therefore, relationships between past and current exercise may simply occur from activity as a common cause.

A few avenues of future research may improve the understanding of the linear relationships between personality, social-cognition and exercise behavior. First, previous research has suggested that exercise may not be best suited for study with personality as an "all or none" conceptualization, but rather in the form of stages of preparedness (Rhodes, Courneya, & Bobick, 2001). This research identified precontemplators (those individuals not considering the adoption of regular exercise) were not differentiated from any other stage of exercise behavior based on personality. One possible explanation for this finding may be related to the theorized motivational properties of personality. The five factor domains are non-health, and non-exercise specific and are hypothesized to exert influence through temperamental, experiential, and instrumental effects (Costa & McCrae, 1992). Currently, activity may be the personality trait best suited for a continuous variable of exercise behavior, as it likely provides the strongest temperamental effect towards actively seeking exercise. However, other personality characteristics may exert an instrumental influence on exercise behavior once

precontemplators are excluded from analysis. For example, it may be that high C individuals are no more likely to decide to exercise than low C individuals, but once they do decide to exercise, their high C personality makes it more likely that they will follow through on their commitment. Consequently, the precontemplation stage may include high C individuals who have not made a commitment to exercise in addition to low C individuals. An opposite instrumentally inhibiting effect may also be hypothesized for N, as research has identified that individuals high on N seem to possess poorer coping skills and greater emotional reactivity during stress appraisal than people low in N (Gunthert, Cohen, & Armeli, 1999). The differential importance of personality dependent on exercise stage highlights one of the key advantages of using a stage model to conceptualize exercise behaviour change (Weinstein et al., 1998). Moreover, it suggests that studies examining the relationship between personality and a continuous measure of exercise behavior likely underestimate the magnitude of the relationship of instrumental personality effects, because individuals in precontemplation were not separated from other exercise stages.

Second, only three facets of each larger personality domain were utilized in the current models. Although these domains were found to be reliable facets of the NEO-FFI in previous research (Saucier, 1998), more facets are likely to encompass these large domains (Costa & McCrae, 1992). For example, E may include facets of assertiveness, and adventurousness, which are not represented in the present facet structure. In either case, activity still seems the most theoretically relevant personality facet for extraversion in the exercise domain. However, more facets of N and C may yield more information about the specific effects of facets in these domains.

Finally, interactions among the FFM general factors and facets may yield a more complete description of the exercise personality. For example, a high activity, low N, and high C individual may be more predictive of regular exercise behavior than an individual high on activity alone. Future research may wish to investigate these possible personality styles for improved clarity of the relationships between personality, social-cognition, and exercise behavior.

One principal limitation of the analysis of personality upon the TPB may be the current conceptualization and measurement of personality. The poor model fit of the FFM in structural equation modeling has been highlighted in previous research and has generally been dismissed due to the rigors of structural equation models in comparison to exploratory factor analysis (Church & Burke, 1994; Silva et al., 1994; Tokar, Fischer, Snell & Harik-Williams,1999). Despite the FFM and a majority of personality trait models being developed using exploratory factor analysis does not preclude these models from being tested for acceptability using structural equation modeling. Currently, the failing model of the FFM suggests that current conceptualization is inadequate and limits the confidence of applied researchers who wish to explore the effects of personality upon behavior. For example, although the FFM concepts of N, E, O, A, and C are purportedly orthogonal, the correlations between N, E, A, and C can exceed 25% shared variance as reported in both study 1 and study 2. This suggests that much of the variance of E or activity upon exercise behavior may also be from N, A, or C. Future research in personality needs to improve the conceptualization of the model, the measurement of concepts, or perhaps both in order to improve correspondence with observed data. Suggestions of improving model fit in the measurement model may be to use only the

"purest" indicators for each concept (in representativeness and relevance of their respective domain), thereby reducing measurement error (Hayduk, 1996) or acknowledge the cross-loadings of personality concepts (Costa & McCrae, 1995) in an a priori measurement model. At the structural level, modeling personality concepts at the first order level in correlated clusters (to represent the FFM) as highlighted by Saucier & Ostendorf (1999) rather than second order structures may also improve model fit. It remains likely, given the misfit of current models, that all of these strategies are required in some part to improve personality measurement and conceptualization.

CHAPTER 5: RESULTS AND DISCUSSION OF PURPOSE 3

Results

Specific Analyses Procedures

Given the hypothesized domain representativeness and relevance of the single item intention item, this indicator was given a fixed error variance of 10%. Analysis of moderating effects of the FFM upon the TPB were investigated using two-group (high, low) stacked structural equation models as suggested by Hayduk (1989). These two-group structural equation models of the TPB were created using a median split for each FFM personality trait. Facet traits were not considered in the analysis strategy because of low reliability (α <.65). Given the reduced sample sizes for analysis, added constraints were implemented to reduce the number of parameters under estimation and improve power. Specifically, fixed error estimates of 30% error were imposed upon the scaled indicator (i.e., the first indicator of each latent concept) based upon the recommended procedure by Hayduk (1989, 1996). The 30% fixed error was chosen based upon previous structural equation models using similar measures of the TPB (Rhodes et al., 2001; Rhodes, Jones, & Courneya, 2001) and the suggested lower limit of acceptability for error in such measures (i.e., α = .70). To further constrain the model, equality constraints were forced upon the remaining concept loadings in the measurement model as well as their correlated exogenous concepts at the structural level across the two groups.

To examine moderating effects, the unconstrained structural effects of the TPB across the two groups were systematically compared with constrained (to be equal)

effects. Using this analysis, evidence for a moderator relationship is apparent if the χ^2 is significantly larger for the constrained effect model than the unconstrained effect model (Bollen, 1989). Based upon the large number of comparisons and exploratory nature in this analysis, alpha was set at .01.

Investigating the Moderating Effects of Personality on the Theory of Planned Behavior

Table 5.1 outlines the model fit for the moderator analysis of N, E, O, A, and C. Overall, the fit for these constrained models was not poor despite the significant χ^2 in each analysis, though the TPB models for study 1 fit the observed data better than for study 2. Modification indices and standardized residuals suggested no small number of changes that would radically improve the model fit, and the significant ($p<.05$) χ^2 appears to result from minor misfiting of multiple parameters throughout the models. As such, the effects within the model can be interpreted with "moderate" confidence. Table 5.2 details the unstandardized factor loadings for both undergraduates and cancer survivors when the groups are dichotomized in each of the FFM dimensions. All loadings for the latent concepts were statistically significant ($p<.05$). Further, no correlated structural disturbance terms for all TPB concepts exceeded a standardized effect of .60, suggesting TPB concept distinctness in both studies. Table 5.3 and 5.4 detail the results of the test for moderation across the FFM for study 1 and study 2 respectively. Tables 5.5 (study 1) and 5.6 (study 2) present the standardized effects for the TPB across low and high levels of the FFM.

Overall, four significant moderating effects ($p<.01$) were found in study 1. Specifically, moderating effects of E for the effect of affective attitude upon intention

(high = .31; low = -.12), O for the effect of instrumental attitude upon intention (high = .36; low = -.01), and C for the effects of self-efficacy upon intention (high = .84; low = .26), and intention upon exercise behavior were found (high = .81; low = .42). In contrast, no moderating effects of the FFM were found significant ($p<.01$) upon the TPB in study 2 of cancer survivors.

TABLE 5.1 MODEL FIT STATISTICS FOR MODERATING ANALYSIS AMONG UNDERGRADUATES AND CANCER SURVIVORS

	Undergraduate Students				Cancer Survivors			
Personality Factor	χ^2	df	RMSEA	CFI	χ^2	df	RMSEA	CFI
Neuroticism	288.46	229	.04	.95	364.18	229	.07	.93
Extraversion	296.57	229	.05	.94	409.05	229	.08	.91
Openness to Experience	296.71	229	.05	.95	371.52	229	.07	.93
Agreeableness	323.16	229	.05	.93	430.36	229	.08	.90
Conscientiousness	290.47	229	.04	.95	376.86	229	.07	.93

Note: All χ^2 results $p<.05$.

TABLE 5.2 UNSTANDARDIZED FACTOR LOADINGS FOR THE TPB AND THE FFM FOR UNDERGRADUATE STUDENTS AND CANCER SURVIVORS

	Five Factor Model of Personality									
	Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
Concept	US	CS	US	CS	US	CS	US	CS	US	CS
Affective Attitude										
Enjoyable	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Interesting	.79*	.78*	.81*	.77*	.83*	.80*	.79*	.83*	.82*	.76*
Relaxing	.61*	.78*	.59*	.77*	.65*	.79*	.71*	.79*	.62*	.77*
Instrumental Attitude										
Useful	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wise	.70*	.71*	.71*	.73*	.71*	.72*	.76*	.78*	.73*	.72*
Beneficial	.80*	.91*	.77*	.92*	.83*	.89*	.83*	.91*	.78*	.86*
Injunctive Norm										
Want me to exercise	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Approve if I exercised	.50*	.81*	.49*	.83*	.51*	.81*	.81*	.83*	.53*	.78*
Descriptive Norm										
Friends	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Family	.62*	.94*	.58*	.91*	.62*	.91*	.77*	.88*	.62*	.88*
Social Support										
Help me exercise	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Provide the support I need	.79*	.83*	.84*	.80*	.79*	.88	.87*	.85*	.83*	.83*
Self-efficacy										
Ability to exercise	.67*	.75*	.67*	.73*	.67*	.74*	.80*	.78*	.78*	.75*
Confidence to exercise	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Confidence to overcome barriers	.61*	.76*	.62*	.72*	.66*	.76*	.74*	.77*	.70*	.77*
Intention										
Number of times per week	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Exercise Behavior										
Strenuous and moderate frequency	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note: US = Undergraduate Students; CS = Cancer Survivors. * = $p < .05$.

TABLE 5.3 CHI-SQUARE DIFFERENCE TEST (1 DF) FOR MODERATING EFFECTS OF PERSONALITY UPON THE TPB FOR UNDERGRADUATES

		Five Factor Model of Personality				
Structural Effects		Neuroticism χ^2	Extraversion χ^2	Openness χ^2	Agreeableness χ^2	Conscientiousness χ^2
Affective Attitude	→ Intention	0.88	8.18*	1.92	2.32	5.10
Instrumental Attitude	→ Intention	4.14	0.01	7.66*	0.01	0.67
Injunctive Norm	→ Intention	5.39	0.48	1.85	0.15	0.00
Descriptive Norm	→ Intention	0.00	4.31	0.00	1.17	2.66
Social Support	→ Self-Efficacy	0.12	0.41	0.35	0.00	0.00
Social Support	→ Intention	1.50	0.84	0.49	0.04	1.30
Social Support	→ Exercise	1.93	0.00	0.07	1.89	0.10
Self-efficacy	→ Intention	0.00	0.12	0.00	1.75	10.79*
Self-efficacy	→ Exercise	1.97	1.26	0.10	6.05	3.58
Intention	→ Exercise	0.41	0.03	0.07	4.04	7.88*

Note: * = $p<.01$

TABLE 5.4 CHI-SQUARE DIFFERENCE TEST (1 DF) FOR MODERATING EFFECTS OF PERSONALITY UPON THE TPB FOR CANCER SURVIVORS

		Five Factor Model of Personality				
Structural Effects		Neuroticism χ^2	Extraversion χ^2	Openness χ^2	Agreeableness χ^2	Conscientiousness χ^2
Affective Attitude	→ Intention	0.25	3.04	1.34	3.44	0.59
Instrumental Attitude	→ Intention	0.07	0.13	0.39	2.23	3.88
Injunctive Norm	→ Intention	0.55	0.00	0.73	2.45	1.16
Descriptive Norm	→ Intention	0.24	0.05	0.19	0.03	0.00
Social Support	→ Self-Efficacy	2.76	0.22	0.45	0.00	0.70
Social Support	→ Intention	0.00	0.74	3.42	0.00	3.98
Social Support	→ Exercise	0.30	0.42	1.07	0.29	1.11
Self-efficacy	→ Intention	0.00	3.50	1.65	1.94	3.64
Self-efficacy	→ Exercise	1.84	1.25	2.61	0.00	0.03
Intention	→ Exercise	3.59	0.00	1.06	2.88	0.44

Note: * = $p<.01$

TABLE 5.5 STANDARDIZED STRUCTURAL EFFECTS OF HIGH AND LOW FFM SCORES UPON THE TPB FOR UNDERGRADUATES

Structural Effects			Five Factor Model of Personality									
			Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
			High (N=147)	Low (N=133)	High (N=146)	Low (N=134)	High (N=146)	Low (N=144)	High (N=137)	Low (N=143)	High (N=142)	Low (N=153)
Affective Attitude	→	Intention	.17	-.02	.31*	-.12	-.12	.07	-.18	.17	-.09	.28*
Instrumental Attitude	→	Intention	.00	.32*	.10	.22*	.36*	-.01	.19	.19*	-.02	.17
Injunctive Norm	→	Intention	.14	-.16	-.01	.02	-.11	.00	-.03	.03	.01	.00
Descriptive Norm	→	Intention	.06	.10	-.13	.26*	.12	-.01	.02	.14	-.14	.18
Social Support	→	Self-Efficacy	.38*	.42*	.28*	.41*	.37*	.36*	.40*	.36*	.39*	.37*
Social Support	→	Intention	-.12	-.01	.00	-.11	-.02	-.06	-.06	-.09	.05	-.09
Social Support	→	Exercise	.10	-.08	-.10	.03	.06	.00	-.09	.11	.02	.05
Self-efficacy	→	Intention	.53*	.47*	.45*	.55*	.54*	.67*	.73*	.44*	.84*	.26*
Self-efficacy	→	Exercise	.15*	.37*	.35*	.15	.29*	.27*	.52*	.08	.06*	.52*
Intention	→	Exercise	.68*	.63*	.65*	.62*	.66*	.60*	.48*	.77*	.81*	.42*

Note: * = $p < .05$ (one-tailed). Underline indicates significant difference of $p < .01$.

TABLE 5.6 STANDARDIZED STRUCTURAL EFFECTS OF HIGH AND LOW FFM SCORES UPON THE TPB FOR CANCER SURVIVORS

Structural Effects		Five Factor Model of Personality									
		Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
		High (N=147)	Low (N=133)	High (N=146)	Low (N=134)	High (N=146)	Low (N=144)	High (N=137)	Low (N=143)	High (N=142)	Low (N=153)
Affective Attitude	→ Intention	.15	.25*	.11	.27*	.27*	.13	-.02	.31*	.13	.28*
Instrumental Attitude	→ Intention	-.12	-.06	-.01	-.11	-.08	-.12	.00	-.21	-.17	.11
Injunctive Norm	→ Intention	.06	-.05	-.06	.03	-.02	.07	-.18	.12	.07	-.09
Descriptive Norm	→ Intention	.18*	.07	.23	.10	.15	.22*	.11	. 18	.13	.17*
Social Support	→ Self-Efficacy	.37*	.19*	.37*	.21*	.38*	.32*	.33*	.34*	.20*	.42*
Social Support	→ Intention	-.04	-.03	.05	-.08	.04	-.17	.05	-.08	-.15	.12
Social Support	→ Exercise	.01	.13	.10	-.01	-.02	.13	.14	.01	.16	-.03
Self-efficacy	→ Intention	.54*	.43*	.40*	.56*	.40*	.61*	.72*	.42*	.65*	.27*
Self-efficacy	→ Exercise	.19*	.35*	.26*	.13	.35*	.08	.25*	.25*	.26*	.17*
Intention	→ Exercise	.52*	.25*	.48*	.43*	.42*	.45*	.28*	.49*	.41*	.47*

Note: * = $p < .05$ (one-tailed).

Discussion

Purpose 3 of this dissertation investigated an exploratory analysis of the possible moderating influence of the FFM upon the theory of planned behavior. These models were tested using a structural equation modeling analysis that estimated the concepts free of measurement error and allow for a test of omnibus model fit.

A moderator analysis of N, E, O, A, and C was conducted for the effects within the TPB for both studies using constrained models to improve power and a more conservative alpha (.01) due to the exploratory nature of the analysis. As mentioned previously, it was generally hypothesized that high N would moderate the TPB by impairing fulfillment of intentions, while high C would moderate the TPB by improving these relationships, yet all pathways for the FFM were examined. Four significant moderating effects ($p<.01$) were found in study 1. Specifically, moderating effects of E for the effect of affective attitude upon intention (high = .31; low = -.12), O for the effect of instrumental attitude upon intention (high = .36; low = -.01), and C for the effects of self-efficacy upon intention (high = .84; low = .26), and intention upon exercise behavior were identified (high = .81; low = .42).

Although N does not appear to moderate the TPB as hypothesized, all of these moderating effects found in study 1 can be theoretically explained and interpreted, though future research is required for confirmation given post-hoc explanation. For example, E is thought to generally motivate individuals through temperamental means (Costa & McCrae, 1992). As such individuals higher in E may intend to engage in behaviors that have stronger affective evaluations than individuals lower in E. A

practical implication of this finding suggests that undergraduates higher in E may especially benefit from interventions to increase affective attitudes towards exercise.

Interpretation of the moderating effect of O requires an investigation into the principle properties of this trait. Intellect is thought to be a strong component of openness to experience. In fact, some FFM theorists use intellect as the label of this trait rather than O (Goldberg, 1993; Digman, 1991). Therefore, it is theoretically appropriate for those individuals higher in intellect to intend to engage in a behavior based upon their instrumental evaluations more than those individuals lower in intellect. The practical implications of this finding suggest that the instrumental benefits of exercise may be an important intervention strategy for undergraduates high on O.

Finally, the moderating effects for C found in study 1 are in agreement with our original hypothesis. Conscientious individuals appear to not only intend to act upon their confidence to perform a behavior, but also act upon their intentions more than low C individuals. This suggests that special attention in interventions may need to be provided in improving intentions and self-efficacy among high C individuals given the likelihood of this instrumental effect. However, low C individuals may need subsidiary help to offset the effects of this moderating effect of poor intention-behavior correspondence, possibly in the form of goal-setting, time management and motivation enhancement.

In contrast to the findings of study 1, no moderating effects of the FFM were found significant ($p<.01$) upon the TPB in cancer survivors. One obvious reason for this finding may be that the cancer experience simply overwhelms the relatively small effects that personality may exert upon the TPB in a moderating role. In support of this

possibility, relatively few trends between the two samples in their moderating effects were identified with the exception of C and the effect of self-efficacy upon intention. Further, the hypothesis of the moderating role of C upon intention and behavior may have been thwarted by the cross-sectional design of this study also. The cross-sectional design limits the predictive assertion of intention, self-efficacy, and behavior and therefore C likely requires time lagged effect for the instrumental moderation of intention upon behavior.

Another possible reason for this null finding may be that more extreme groups are required than a median split for personality. The current study lacked the power to split the sample into more extreme groups and future research with a larger sample may be able to rectify this limitation. This discrepancy between study 1 and study 2 for FFM moderation of the TPB necessitates future research and replication upon disparate populations before any conclusions can be drawn. One potential general problem may be the measurement error when attempting to represent such broad super traits for more finite analyses such as moderation effects. (Costa & McCrae, 1980) theorize that global estimates do not allow much precision in showing which forms of a trait domain are most characteristic of a person or behavior. Future studies may wish to utilize more specific personality traits such as the facet traits of the FFM found in the longer NEO-PI (Costa & McCrae, 1992), or perhaps more specific traits that represent interactions of the FFM. For example, exercise attitudes (Rhodes & Courneya, 2001) and the TPB (Bozionelos & Bennett, 1999) have been shown to be moderated by self-monitoring, which is an interaction of high E and O (Morrison, 1997). Investigation of these more specific traits may help clarify whether moderating influences are being obscured by broader domains

represented in the FFM. Still, researchers will likely benefit in future research by formulating a priori hypotheses about the relationships between lower-order personality traits, the TPB, and exercise behavior given the multitude of possible analyses.

CHAPTER 6: RESULTS AND DISCUSSION OF PURPOSE 4

Results

Specific Analyses Procedures

Demographics were given a fixed measurement error of 0%, based on the likelihood of only a small fraction of error of measurement in these concepts. For the TPB, the single intention indicator was given a fixed error variance of 10%, given the hypothesized domain representativeness and relevance of the item.

In the mediation analysis of demographics, the TPB, and exercise behavior, a sequential step-wise procedure was implemented for model parsimony. First, all demographic concepts were modeled with potential effects upon exercise behavior. Demographic concepts at the structural level were freed to correlate. Next, any demographic concept with a significant effect upon exercise behavior was subsequently included in the TPB model and freed upon all TPB concepts and exercise behavior.

Analysis of moderating effects of demographic characteristics upon the TPB were investigated using two-group stacked structural equation models. These two-group structural equation models of the TPB were created for gender (male, female), age (using a median split of 62; <62 = low, >62=high), education (low: high school, high: university degree), and employment (working, not working). Given the reduced sample sizes for analysis, added constraints were implemented to reduce the number of parameters under estimation and improve power. Specifically, fixed error estimates of 30% error were imposed upon the scaled indicator (i.e., the first indicator of each latent concept) based upon the suggested procedure by Hayduk (1989, 1996). The 30% fixed error was chosen based upon previous structural equation models using similar measures of the TPB

(Rhodes et al., 2001; Rhodes, Jones, & Courneya, 2001) and the suggested lower limit of acceptability for error in such measures (eg., $\alpha = .70$). To further constrain the model for improved power, equality constraints were forced upon the remaining concept loadings in the measurement model as well as their correlated exogenous concepts at the structural level across the two groups.

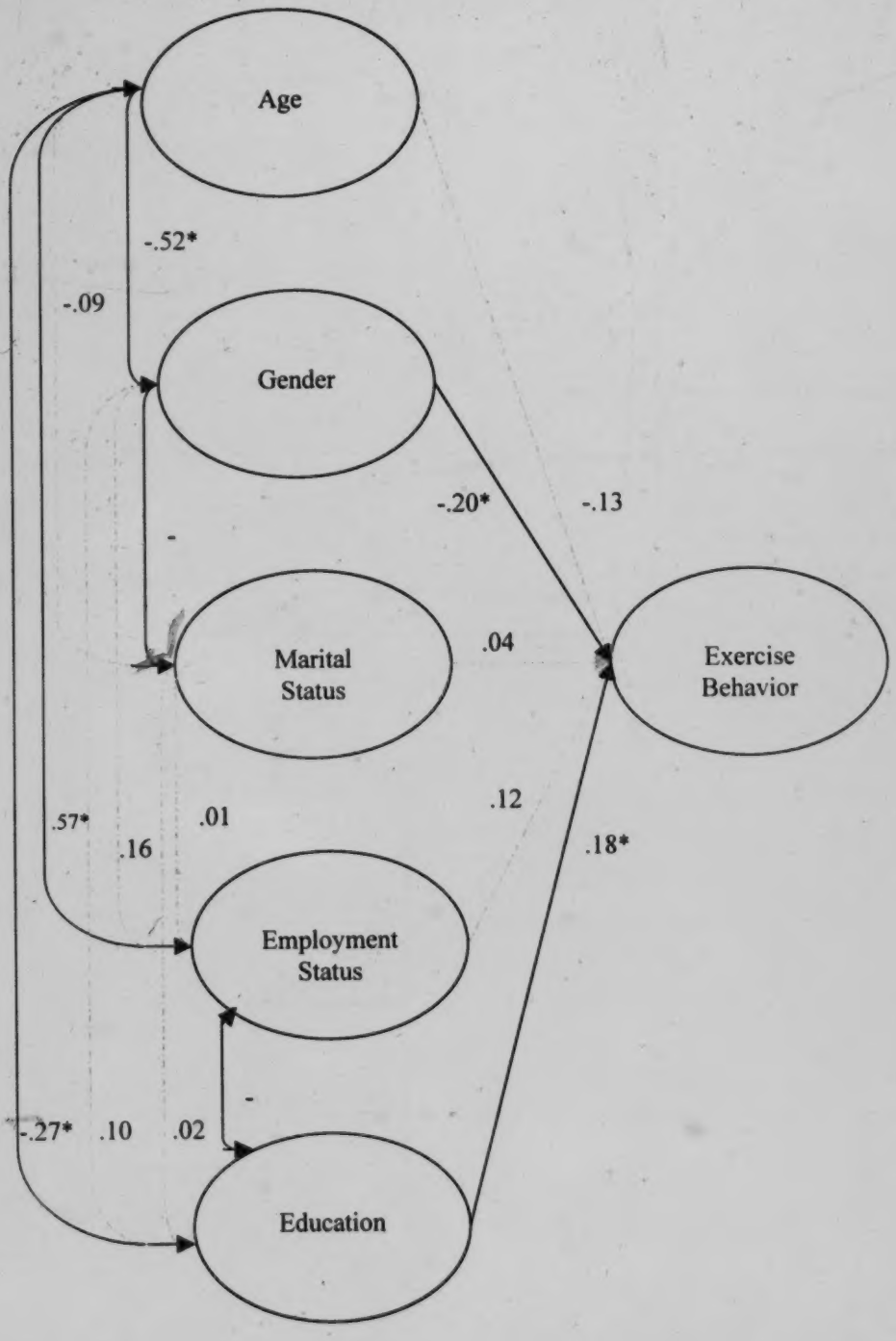
To examine moderating effects, the unconstrained structural effects of the TPB across the two groups were systematically compared with constrained (to be equal) effects. Using this analysis, evidence for a moderator relationship is apparent if the χ^2 is significantly larger for the constrained effect model than the unconstrained effect model (Bollen, 1989). Based upon the large number of comparisons and exploratory nature in this analysis, alpha was set at .01.

Mediation Hypothesis

The models investigating demographics and exercise behavior for both study 1 and study 2 were fully saturated and therefore provide no test of model fit. The structural effect of gender upon exercise for undergraduates was significant ($p<.05$) at -.19, with males exercising more than females. Similarly, for cancer survivors, gender was also significant ($p<.05$) at -.20 along with education at .18, with higher educated individuals exercising more than those with a lower education (See figure 6.1). However, age, marital status, and employment status were not significant ($p>.05$) upon exercise when controlling for the significant effects of gender and education.

FIGURE 6.1 DEMOGRAPHICS UPON EXERCISE BEHAVIOR FOR CANCER SURVIVORS

Note: All effects are standardized; → = p<.05 one-tailed, ⇢ = p>.05 one-tailed.



The final models included only gender for study 1, and gender and education for study 2 freed upon all concepts of the TPB and exercise behavior. This model suggested a moderately good fit of the data for both study 1 (χ^2 [106, N=299] = 140.91, p<.01, CFI = .98, RMSEA = .03) and study 2 (χ^2 [115, N=268] = 200.18, p<.01, CFI = .96, RMSEA = .05). Further, the modification indices and standardized residuals suggested minimal changes that would significantly improve the model fit, supporting that the effects within the model can be interpreted with moderate confidence. Table 6.1 details the means and standard deviations for the indicators as well as the factor loadings and error variances for both study 1 and study 2. All loadings for the latent concepts were statistically significant (p<.05). Further, no correlated structural disturbance terms for all TPB concepts exceeded standardized effects of .40, suggesting concept distinctness in both models. Figure 6.2 details the structural effects of the model for study 1 and figure 6.3 details the structural effects for study 2. Specifically, in study 1, gender had a significant (p<.05) effect upon descriptive norm (-.14), self-efficacy (-.15), and exercise behavior (-.12) even while controlling for intention, self-efficacy, and social support, with males having stronger self-efficacy, descriptive norm, and exercise. For study 2, gender had significant (p<.05) effect upon self-efficacy (-.17) and intention (-.14) even when controlling for attitudes, social influences, and self-efficacy, with males having higher self-efficacy and intentions. Similarly, education also had significant (p<.05) effects upon both instrumental attitude (.11) and self-efficacy (.19), with higher educated individuals having higher instrumental attitudes and self-efficacy. Taken together, 35% and 34% of the variance in intention and 50% and 23% of the variance in exercise behavior were explained by study 1 and study 2 respectively.

TABLE 6.1 FACTOR LOADINGS FOR DEMOGRAPHICS, THE TPB AND EXERCISE AMONG UNDERGRADUATES AND CANCER SURVIVORS

	Mean		SD		Factor Loading		Error Variance	
	US	CS	US	CS	US	CS	US	CS
Gender					.98	.98	.00	.00
Education					N/A	.98	N/A	.00
Affective Attitude								
Enjoyable	5.29	4.87	1.52	1.64	.76	.87	.43	.25
Interesting	4.89	4.80	1.43	1.52	.75	.70	.44	.51
Relaxing	5.05	5.08	1.41	1.43	.58	.74	.66	.46
Instrumental Attitude								
Useful	6.23	5.91	0.86	1.27	.82	.91	.32	.17
Wise	6.30	6.18	0.78	0.97	.66	.82	.57	.33
Beneficial	6.41	6.01	0.84	1.09	.70	.89	.51	.21
Injunctive Norm								
"want"	5.21	5.31	1.38	1.56	.75	.90	.44	.18
"approve"	6.33	5.97	1.03	1.25	.61	.79	.63	.37
Descriptive Norm								
Friends exercise	4.40	3.94	1.69	1.70	.74	.72	.45	.48
Family exercise	3.92	4.12	1.86	1.99	.48	.72	.77	.48
Social Support								
"help me exercise"	4.48	3.71	1.91	2.10	.89	.82	.21	.33
"provide support"	5.14	4.48	1.76	2.01	.70	.73	.52	.47
Self-Efficacy								
Confidence	5.42	5.02	1.75	1.91	.94	.66	.11	.56
Barrier	5.19	5.35	1.47	1.55	.66	.73	.56	.46
Ability	6.10	6.00	1.31	1.42	.76	.88	.42	.22
Intention	4.52	3.73	1.36	1.95	.95	.95	.10	.10
Exercise Behavior	1.95	2.42	2.00	2.83	.77	.77	.40	.40

Note: All loadings $p<.05$. US = Undergraduate students; CS = cancer survivors.

FIGURE 6.2 EFFECT OF GENDER UPON THE TPB AND EXERCISE BEHAVIOR FOR UNDERGRADUATES
Note: All effects are standardized; * = p<.05 one-tailed.

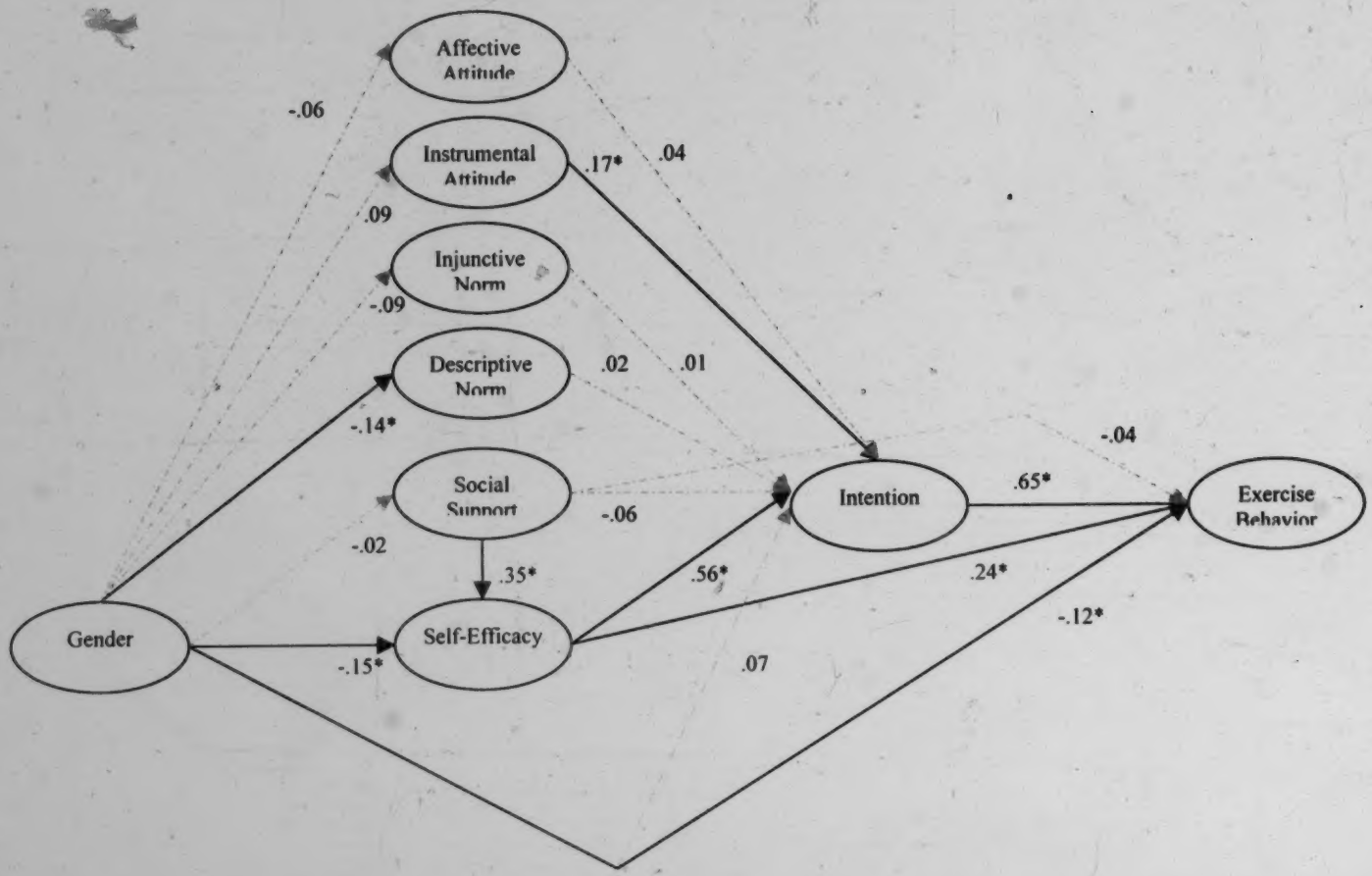
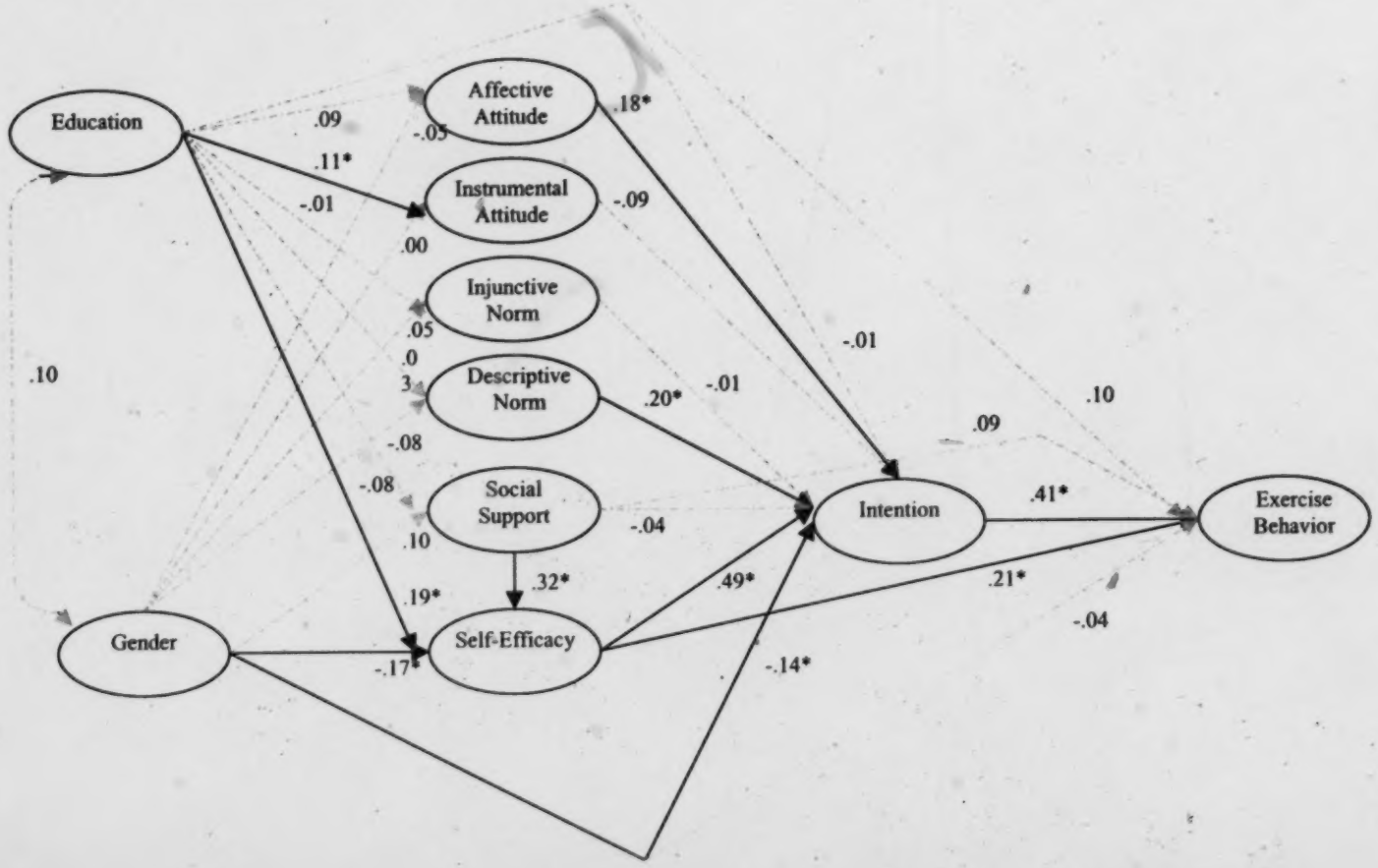


FIGURE 6.3 EFFECT OF GENDER AND EDUCATION UPON THE TPB AND EXERCISE BEHAVIOR FOR CANCER SURVIVORS

Note: All effects are standardized; * = p<.05 one-tailed.



Moderating Hypothesis

Table 6.2 outlines the model fit for the moderator analysis of demographics. Overall, the fit for these constrained models was not poor despite the significant χ^2 in each analysis. Modification indices and standardized residuals suggested minimal changes that would significantly improve the model fit, and the significant ($p<.05$) χ^2 appears to result from overall minor misfit of multiple coefficients throughout the models. As such, the effects within the model can be interpreted with moderate confidence. Table 6.3 details the unstandardized factor loadings for both study 1 and study 2 among each model of demographics. All loadings for the latent concepts were statistically significant ($p<.05$). Further, no correlated concepts / structural disturbance terms for all TPB concepts exceeded .60, suggesting TPB concept distinctness in both studies. Table 6.4 details the results of the test for moderation for study 1 and study 2 respectively. Further, Table 6.5 highlights the standardized effects for the TPB across the moderator divisions. Overall, no moderating effects of the demographics were found significant ($p<.01$) upon the TPB in either group.

TABLE 6.2 MODEL FIT STATISTICS FOR MODERATING ANALYSIS AMONG UNDERGRADUATES AND CANCER SURVIVORS

	Model Fit			
Demographic	χ^2	df	RMSEA	CFI
Gender (US)	328.06	229	.05	.93
Gender (CS)	412.55	229	.08	.91
Age (CS)	377.94	229	.07	.92
Education	334.63	229	.06	.93
Employment Status	342.69	229	.06	.94

Note: US = Undergraduate Students; CS = Cancer Survivors. All χ^2 results $p<.05$.

TABLE 6.3 UNSTANDARDIZED FACTOR LOADINGS FOR THE TPB AND DEMOGRAPHICS FOR UNDERGRADUATES AND CANCER SURVIVORS

	Demographic Characteristics				
	Gender		Age	Education	Employment
Concept	US	CS	CS	CS	CS
Affective Attitude					
Enjoyable	1.00	1.00	1.00	1.00	1.00
Interesting	.83*	.78*	.76*	.75*	.76*
Relaxing	.66*	.76*	.77*	.75*	.76*
Instrumental Attitude					
Useful	1.00	1.00	1.00	1.00	1.00
Wise	.70*	.75*	.75*	.75*	.73*
Beneficial	.80*	.89*	.89*	.92*	.90*
Injunctive Norm					
Want me to exercise	1.00	1.00	1.00	1.00	1.00
Approve if I exercised	.47*	.80*	.77*	.79*	.79*
Descriptive Norm					
Friends	1.00	1.00	1.00	1.00	1.00
Family	.59*	.89*	.88*	.90*	.89*
Social Support					
Help me exercise	1.00	1.00	1.00	1.00	1.00
Provide the support I need	.81*	.81*	.82*	.83*	.81*
Self-efficacy					
Ability to exercise	.65*	.79*	.80*	.90*	.78*
Confidence to exercise	1.00	1.00	1.00	1.00	1.00
Confidence to overcome barriers	.67*	.77*	.76*	.87*	.77*
Intention					
Number of times per week	1.00	1.00	1.00	1.00	1.00
Exercise Behavior					
Strenuous and moderate frequency	1.00	1.00	1.00	1.00	1.00

Note: US = Undergraduate Students; CS = Cancer Survivors. * = $p < .05$.

TABLE 6.4 CHI-SQUARE DIFFERENCE TEST (1 DF) FOR MODERATING EFFECTS OF DEMOGRAPHICS UPON THE TPB

Structural Effects	Demographic Characteristics				
	Gender (US) χ^2	Gender (CS) χ^2	Age χ^2	Education χ^2	Emplyoment χ^2
Affective Attitude → Intention	1.89	1.65	0.00	1.79	0.33
Instrumental Attitude → Intention	0.66	0.34	0.39	1.12	1.11
Injunctive Norm → Intention	0.40	0.52	0.31	0.74	0.54
Descriptive Norm → Intention	0.00	0.00	0.96	0.62	4.10
Social Support → Self-Efficacy	0.59	0.63	0.45	0.00	0.25
Social Support → Intention	0.15	0.48	0.10	4.22	0.01
Social Support → Exercise	0.01	2.36	2.41	0.01	0.00
Self-efficacy → Intention	2.54	0.11	2.02	0.66	3.43
Self-efficacy → Exercise	0.02	0.56	0.64	0.65	4.76
Intention → Exercise	0.03	3.34	2.07	2.10	2.13

Note: * = $p<.01$.

TABLE 6.5 STANDARDIZED STRUCTURAL EFFECTS OF DEMOGRAPHICS UPON THE TPB FOR UNDERGRADUATES AND CANCER SURVIVORS

Structural Effects			Demographics									
			Gender (US)		Gender (CS)		Age (CS)		Education (CS)		Employment (CS)	
			Females (N=217)	Males (N=80)	Females (N=196)	Males (N=82)	Young (N=139)	Old (N=129)	Low (N=113)	High (N=112)	Working (N=100)	Not Working (N=168)
Affective Attitude	→	Intention	.10	-.12	.13	.31*	.22*	.16	.23*	.00	.32*	.07
Instrumental Attitude	→	Intention	.14	.26*	-.13	.06	-.17	-.07	-.17	.01	-.18*	-.01
Injunctive Norm	→	Intention	.05	-.08	-.02	.13	.09	.03	.04	-.12	.21	-.06
Descriptive Norm	→	Intention	.07	.14	.13	.15	.05	.16	.19*	.32*	-.12	.23*
Social Support	→	Self-Efficacy	.39*	.36*	.35*	.25*	.37*	.26*	.35*	.32*	.26*	.32*
Social Support	→	Intention	-.10	-.03	-.04	.05	-.06	.01	-.24*	.16	-.20	.00
Social Support	→	Exercise	.05	-.05	.19*	-.09	.24*	-.02	.05	.11*	.15	.09
Self-efficacy	→	Intention	.50*	.63*	.59*	.24*	.46*	.55*	.65*	.45*	.42*	.58*
Self-efficacy	→	Exercise	.24*	.18	.32*	.11	.30*	.07	.17	.26*	.44*	.07
Intention	→	Exercise	.60*	.84*	.31*	.53*	.39*	.52*	.52*	.28*	.29*	.54*

Note: * = $p < .05$ (one-tailed). US = Undergraduate Students; CS = Cancer Survivors.

Discussion

Purpose 4 of this dissertation investigated the mediating hypothesis between demographic characteristics, exercise behavior, and the TPB as well as to investigate the possible moderating influence of demographics upon the TPB within the exercise domain. To test the replicability of both the mediation and moderation findings, we examined these research questions upon two distinct samples. Study 1 modeled gender and the TPB with a convenience sample of undergraduate students, while study 2 modeled gender, age, education, marital status, and employment status, and the TPB with a population sample of cancer survivors.

Mediation Hypothesis

For the mediation hypothesis, it was hypothesized that no demographic characteristic would have a significant effect upon exercise behavior while controlling for the TPB based on the tenets of the TPB (Ajzen, 1991). First, however, demographics were examined for effects upon exercise behavior. Gender had a significant ($p<.05$) influence upon exercise in both the undergraduate and cancer survivor samples, with males having greater exercise frequency than females. Further, in the cancer survivor model, education also had a significant ($p<.05$) effect upon exercise behavior while controlling for the effects of age, gender, marital status, and employment status, with individuals of higher education exercising more then those of lower education. The final model included gender in the undergraduate sample, and gender and education in the cancer survivor sample freed upon all concepts of the TPB and exercise behavior. The key finding was that gender had small, though significant ($p<.05$) direct effects upon

exercise in the undergraduate sample and exercise intention in the cancer survivor sample while controlling for TPB concepts.

These findings have theoretical and applied importance. From a theoretical perspective, the current studies suggest that even an extended TPB model that includes concepts of affective and instrumental attitude, injunctive and descriptive norm, social support, and self-efficacy is insufficient to account for the effects of gender upon intention (study 2) or behavior (study 1). Perhaps a gender oriented social-cognitive concept or concepts are required in addition to the TPB proper. An alternative explanation is that males may place themselves in an exercise behavior context more than females, which influences either planned behavior (i.e., intentions) or behavior independent of intentions, self-efficacy, and social support. Certainly more research is required to investigate these possibilities, especially since recent research has indicated that gender differences in physical activity may begin as early as fifth grade (Craig, Goldberg, & Dietz, 1996).

A practical implication of this research may be that gender needs to be taken into account when developing exercise interventions rather than assuming that targeting social cognitions will subsume these differences. For example, females may require special intervention efforts to increase the antecedents of exercise intention, as gender appears to be an independent predictor from the TPB.

Moderating Hypothesis

A moderator analysis was conducted upon the TPB of gender for undergraduates and age, gender, employment status, and education for cancer survivors. As mentioned previously, the analysis was considered exploratory and all pathways for the

demographics were examined. No moderating effects of demographic characteristics were found significant ($p<.01$) upon the TPB for either study. This replicates Wankel et al.'s (1994) finding of gender not moderating the TPB, and even the moderating effect of age found in that study. Although Wankel et al. (1994) identify significant differences between young adults (<39 years) and older adults (>60 years), cancer survivors are generally older adults and older middle-aged adults. Therefore, the current study lacks the younger age group to adequately test age moderation completely and may be a likely reason for this null finding. More extreme groups may be required than a median split for age among cancer survivors to find a moderating effect in the TPB. Similar findings may also exist for education and employment status, as more extreme groups may yield moderators of the TPB. Unfortunately, the current study lacked the power to split the sample into more extreme groups and future research with a larger sample may be able to rectify this limitation. Still, the current study suggests that no significant difference in the TPB exist for middle-aged and older adults, high school and university education, and employed or non-employed individuals.

CHAPTER 7: GENERAL DISCUSSION

The benefits of exercise have been well documented, yet a majority of the adult population does not exercise. Therefore, understanding the contribution of factors influencing regular exercise is paramount in order to design and implement effective intervention strategies of behavior change. In response to this necessity, a multitude of factors summarized by ecological, social-cognitive, demographic, and personality frameworks have been examined. However, an understanding of the influences upon regular exercise is likely to be guided by theoretical structure (Courneya, 2001). A well-validated theoretical model of social-cognitive influences in the exercise domain is the theory of planned behavior (TPB; Ajzen, 1991), with over 50 studies supporting its utility (Spence et al., 2001). The TPB proposes that social-cognition represents the proximal determinant for engaging in behavior and all other variables related to behavior should be mediated through the TPB proper (Ajzen, 1991). This assertion provides for a test of the structural relationships between other frameworks in causal sequencing and helps organize the mediators of behavior prediction. However, despite its success at behavior prediction and explanation, the TPB currently may have conceptual shortcomings and research questions to elucidate (Conner & Armitage, 1998). This dissertation examined extended conceptions and relative contributions of concepts within the TPB proper (purpose 1), and proposed relationships of the TPB with personality (purpose 2 and purpose 3), and demographic characteristics (purpose 4) among distinct samples of undergraduate students and cancer survivors. These research questions were investigated using various structural equation modeling approaches to examine the robustness of findings through similarities or contrasts of significant effects.

Purpose 1 was to investigate components of affective and instrumental attitude, injunctive and descriptive norm, social support, and self-efficacy and perceived volitional control as predictors of exercise intention and behavior. These TPB components were examined as specific concepts and compared to hypothesized commonality scales acting as unitary constructs. Further, it was argued that specific components are likely to influence a general attitude, social influence, or perceived control concept, rather than the current thinking of second-order conceptualization (Ajzen, 2001). The results suggested different optimal commonality scales and specificity models for attitude, social influence, and PBC to have significant influence upon exercise intention, and behavior suggesting distinct tailored interventions and alternative conceptualizations may be most beneficial for each concept and population. Specifically, though both affective and instrumental attitudes acted on intention sufficiently as a unitary concept, affective attitude was the sole attitude concept responsible for influencing intention among cancer survivors. Further, both injunctive and descriptive norm acted as a unitary subjective norm concept upon intention in both samples, but social support was a significant component of social influence for cancer survivors and not undergraduate students. Finally, it was self-efficacy and not perceived volitional control that had significant effects upon intention and behavior for both samples. These differences underscore the importance of examining multiple populations for the most precise understanding of social-cognitive influences on any health behavior.

Purpose 2 was to investigate the mediating hypothesis between an extended TPB model, personality, and exercise behavior. Based upon previous research (Courneya et al., 1999; Rhodes et al., 2001) and theorizing by Esynck (1981), it was hypothesized that

extraversion's activity facet would have a direct influence upon exercise behavior while controlling for the TPB. This hypothesis was supported, as both populations had significant ($p<.05$) direct effects for extraversion's activity facet on exercise behavior. This finding adds robustness to Rhodes et al., (2001) and suggests that even an extended TPB model is insufficient to account for the influence of personality upon exercise behavior. Further, results support the importance of the activity trait in exercise behavior prediction even when using an extended TPB model and disparate population samples.

Purpose 3 was to investigate an exploratory analysis of the moderating influence of the FFM upon the theory of planned behavior based upon the theorizing of Triandis (1979). Two-group structural equation models of the TPB were created using a median split for each FFM personality trait. Overall, four significant moderating effects ($p<.01$) were found for the undergraduate sample. Specifically, moderating effects of E for the effect of affective attitude upon intention (high = .31; low = -.12), O for the effect of instrumental attitude upon intention (high = .36; low = -.01), and C for the effects of self-efficacy upon intention (high = .84; low = .26), and intention upon exercise behavior were found (high = .81; low = .42). In contrast, no moderating effects of the FFM were found significant ($p<.01$) upon the TPB in study 2 of cancer survivors. Theorized influences for the presence and absence of personality moderators were discussed in the context of both population samples. The results generally support the possibility of personality as a moderator of the TPB but highlight the need for future research and replication.

Finally, purpose 4 investigated the mediating hypothesis between an extended TPB model, demographics, and exercise behavior, as well as the moderating influence of

demographics upon the TPB within the exercise domain. Investigation of the mediation hypothesis indicated that the TPB was insufficient to fully account for the effect of gender, as it had a significant ($p<.05$) effect upon intention (cancer survivors) and behavior (undergraduate students). Demographic characteristics were not found to moderate the TPB. Results of the mediation analysis were discussed in the form of a possible addition of a gender oriented social-cognitive concept for the TPB, while results of the moderator analysis suggest the TPB may be robust to account for variability in demographics.

The findings of these studies and multiple purposes identify that the TPB is a strong theoretical model for exercise behavior planning (i.e., intention) and prediction. However, results of this dissertation also suggest important considerations for TPB based intervention, underscoring the need for distinct tailored interventions of component concepts, personality, and gender within the exercise domain. Still, some limitations of the previous studies, and opportunities for future research warrant mention. First, our hypothesized causal effects in these structural equation models represent one conceptualization of the relationships between the measured indicators. The models were found to have marginal fits of the observed variance/covariance matrices and several alternative models may represent the data equally or better.

Second, the cross-sectional design of study 2 limits the accuracy of a modeled concept of exercise behavior. The TPB concepts were set to predict 2 weeks prospective behavior, which may not be optimally represented by past 2 weeks behavior. However, previous research among similar cancer survivor populations suggests that exercise behavior is very stable with high correlations between past and present behavior

(Courneya, & Friedenreich, 1997, 1999; Courneya, Friedenreich, Authur, & Bobick, 1999). Further, no exercise intervention was delivered in the study, so changes in exercise behavior over the following 2 weeks were not hypothesized. Still, future research is required to examine these multiple TPB concepts as causal influences upon exercise behavior among cancer survivors using a prospective design.

Finally, the measures utilized in these studies were self-report and of similar likert scaling. Though structural equation modeling was utilized to estimate the TPB concepts free of measurement error, some systematic error variance associated with a singular form of scaling may have thwarted optimal error free measurment. Further, the FFM scales used for the moderator analysis were not free of measurement error, suggesting that these analyses may be improved by the elimination of such error.

Overall the results of these papers identify that the TPB is a strong theoretical model for the prediction and explanation of exercise behavior across disparate populations but currently possesses conceptual short-comings and disparities among optimal conceptualization of its components. Further, papers 2 through 4 suggest that the TPB is currently insufficient to fully mediate the relationships of personality and gender upon exercise intentions and behavior, and may be moderated by various personality traits.

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APPENDIX A: SOCIAL SUPPORT AND EXERCISE BEHAVIOR (1985 –PRESENT)

Author (s)	Participants	Design	Social Support Measures	Model	Findings
(Gillett, 1988)	38 moderately over-weight women (M= 41.9 yrs., SD= 5.4)	16 week Experimental Group 1: Exercise class & Reinforcemtnt Group 2: Exercise class	Qualitative interview	NA	Social networks and car-pooling were identified as important to adherence.
(Daltroy & Godin, 1989)	134 spouses of cardiac patients	Cross-Sectional	Questionnaire developed for study	Theory of Planned Behavior	Spousal approval for participation showed a significant association with spousal intentions to encourage participation; subjective norm was a 2nd influential variable.
(King et al., 1990)	399 randomly selected employees of a worksite	Cross-Sectional	Questionnaire developed for study	NA	Employees reporting no regular aerobic activity over the past 2 years reported significantly less support for engaging in exercise both at home and at work.
(Kravitz & Furst, 1991)	266 (Study 1) and 264 (Study 2) undergraduate students.	3 month Quasi-Experimental 1) worked individually for rewards 2) chose 3-person groups for rewards 3) received no reward or social support. In Study 2, Group 2 was made up of 2-person groups.	Defined by Group	NA	Groups 1 and 2 in both studies showed significantly better attendance than Group 3.
(Clifford et al., 1991)	34 overweight healthy middle-aged adults (M = 49 years)	52 week Experimental 1) group plus professional 2) group plus peer 3) group only 4) Assessment only	Defined by Group	NA	Treatment groups improved significantly over the assessment only group in weight, percentage body fat, cardiovascular fitness, exercise adherence, health-risk appraisal, chronic tension, and blood pressure at both post-treatment and 6-month follow-up. No significant differences were found among the treatment groups on any of the outcome measures.
(Williams et al., 1991)	40 volunteer end stage renal disease patients	12 week prospective home-based exercise program.	Questionnaire developed for study	NA	Adherent patients were found to have encouraging support groups (75 versus 25%).
(Treiber et al., 1991)	Study 1: 230 middle-class male and female teachers	Cross-Sectional	Sallis social support scale	NA	In both studies, social support for exercise significantly positively correlated with physical activity.

	(M = 38.5 yrs., SD= 8.9) Study 2: 238 lower- to middle-class males and females (M = 35.8 yrs., SD = 5.1).				
(Sallis et al., 1992)	1739 adults	24 month longitudinal	Sallis social support scale	Social Cognitive Theory	Self-efficacy, perceived barriers, family support, and friend support were significantly associated with exercise change. Social learning variables accounted for 12.3-15.5% of the variance in exercise change over 24 months.
(Duncan et al., 1993)	44 sedentary women and 41 sedentary men (43-64 yrs.) in their 10th wk of an exercise program	Cross-Sectional	Social Provisions Scale	NA	Among females, the social provisions of guidance and reassurance of worth significantly discriminated exercise adherers and nonadherers. The provisions of social integration and guidance significantly discriminated adherers and nonadherers among males.
(Duncan & McAuley, 1993)	851 sedentary adults (aged 45-64 yrs)	10 week prospective	Social Provisions Scale	Social Cognitive Theory	Self-efficacy significantly mediated the relationship between social support and exercise.
(Duncan et al., 1993)	41 men & 45 women (M= 53.8 yrs., SD =5.9)	6 month prospective	Social Provisions Scale	Social Cognitive Theory	Participants with a greater sense of self-worth were more likely to adhere throughout the program. Participants perceiving higher levels of guidance were less likely to adhere during the early and concluding stages of the exercise program. Self-efficacy was not predictive of intraindividual change in attendance over time.
(Eaton et al., 1993)	1081 adults (19-64 yrs.)	4 year longitudinal	Health club affiliation & encouragement from children	NA	Health club affiliation was negatively associated with exercise for males. Children encouragement was significantly associated with exercise for females.
(Minor & Brown, 1993)	120 arthritis patients (M=54.3 yrs.; 82% female)	18 month prospective	Questionnaire developed for study	NA	Social support predicted exercise at 9 months but not for 3 month or 18 month periods.

(Duncan & Stoolmiller, 1993)	41 males & 44 females (M= 54.0 yrs., SD= 5.7)	10 week prospective	Social Provisions Scale	Social Cognitive Theory	Efficacy cognitions appeared to serve a mediational function in the synchronous relationship between social support and exercise behavior but a longitudinal relationship was not supported.
(Duncan et al., 1994)	323 volunteers from aerobic exercise programs (M= 49.1 yrs.; 93% female).	5-8 week prospective	Social Provisions Scale	Social Cognitive Theory including Hardiness	The path between social support and hardiness was statistically significant supporting a mediation effect.
(Felton & Parsons, 1994)	225 average-weight and 115 overweight young women.	Cross-Sectional	Questionnaire developed for study	NA	Social support predicted exercise for over-weight but not average-weight women.
(Wankel et al., 1994)	3,679 adults (aged 19-60+ yrs.)	Cross-Sectional	Questionnaire developed for study	Theory of Planned Behavior	PBC & attitudes were better predictors of intention than social support. Social support contributed more to the prediction of intention among participants aged 60+ than other age groupings.
(Horne, 1994)	Rural homemakers (n = 630)	Cross-Sectional	Questionnaire developed for study	Theory of Planned Behavior	Intentions, self-efficacy, and various beliefs related to barriers and social support discriminated active from inactive homemakers. For active homemakers, attitude, perceived social support, and self-efficacy predicted future intentions. For inactive homemakers, only attitude and self-efficacy predicted intentions.
(Courneya & McAuley, 1995)	62 adults (M= 39 yrs.; 77% female)	12 week prospective	Social provisions scale	Theory of Planned Behavior	Identified a significant path from social support to exercise adherence through perceived behavioral control, & intention.
(Cousins, 1995)	327 older women (M=77 yrs.)	Cross-Sectional	Questionnaire developed for study	NA	Social support was significantly associated with reported exercise behavior.
(Oka et al., 1995)	269 men and women (50-65 yrs.)	1 year prospective	Questionnaire developed for study	NA	Support from exercise staff was negatively associated with exercise adherence in the first 6 months. Support from friends and family was associated with exercise in second six months. General composite of social support was non-significant for both time points.
(Wallace et al.,	Married Pairs	year quasi-experimental	Defined by Group	NA	For married pairs, attendance was significantly

1995)	were 16 couples and Married Singles were 16 married men and 14 married women.	1) with spouse (married pairs) 2) without spouse (married singles)			higher and dropout was significantly lower than for married singles.
(Cousins, 1996)	327 older women (M=77 yrs.)	Cross-Sectional	Questionnaire developed for study	Social Cognitive Theory	Social support was found significantly associated with reported exercise behavior.
(Fuchs, 1996)	149 women & 150 men (40-70 yrs.)	6 month longitudinal	Questionnaire developed for study	Theory of Planned Behavior	Social support exerted a significant direct effect upon exercise behavior and significant indirect effects through self-efficacy and perceived health benefits.
(Muto et al., 1996)	515 male employees of a Japanese business	Cross-Sectional	Questionnaire developed for study	Social Cognitive Theory	Colleague support was significantly associated with exercise behavior but family, friend and health staff support were not.
(Oka et al., 1996)	35 men & 8 women (M=60.0 yrs.) with heart failure	Cross-Sectional	Marital status	NA	Marital status and exercise behavior was found to be a non-significant association.
(Booth et al., 1997)	1232 adults divided into age groups of 18-39; 40-59; and 60-79.	Cross-Sectional	Prefered sources of support: 1) doctor 2) group	NA	38% prefered doctor support, 31% prefered group support & 20% did not want support. Younger groups (18-59) significantly prefered group support over 60-79 yr. olds. 60-79 yr. olds significantly prefered doctor support over younger groups (18-59).
(Calfas et al., 1997)	255 (M=39 yrs.; 84% women) sedentary, adult patients.	6 week quasi-experimental: 1) physician-based intervention 2) control	Questionnaire developed for study	Stages of Change	Social Support was non-significant.
(King et al., 1997)	197 men & 160 women (50-65 yrs.)	Prospective beginning after the first year of exercise initiation	Interpersonal support evaluation list	Social Cognitive Theory	No significant associations between social support and exercise.
(Steptoe et al., 1997)	7302 men & 9181 women (undergraduate	Cross-Sectional	Questionnaire developed for study	NA	Social support and Exercise were significantly associated.

	students)				
(Nies et al., 1998)	16 women aged 35-50	Focus group	NA	NA	Social support was stressed as a neccesary component for exercise adherence.
(Leslie et al., 1999)	2,729 male and female students (median age was 20 years)	Cross-Sectional	Questionnaire developed for study	NA	Lower social support from family and friends was a significant independent predictor of being insufficiently active for both males and females.
(Sternfeld et al., 1999)	2,636 ethnically diverse women members of a large health maintenance organization, ages 20-65.	Cross-Sectional	Questionnaire developed for study	Social Cognitive Theory	Social support and self-efficacy were significantly associated with increased likelihood of high levels of sports/exercise and active living.
Courneya et al., 2000	1,557 adults (18-65 years) in a population sample	Prospective	Questionnaire developed for study	Theory of Planned Behavior/ Stage of Change	Social support was superior to subjective norm in predicting exercise intention and stage
Kelsey et al., 2000	859 adult women	Cross-sectional	Questionnaire developed for study	N/A	Social support was significantly associated with physical activity
Steptoe et al., 2000	234 male and 271 female sedentary primary care patients	Randomized clinical trial	Questionnaire developed for study	Stages of Change	Changes in exercise 12 months later were significantly greater for behavioral counseling group and social support
Wilcox et al., 2000	1,242 rural and 1,096 urban women (40-70 years)	Cross-sectional	Questionnaire developed for study	N/A	Social support correlated with physical activity for both rural and urban women
Rhodes et al., 2001a	193 undergraduate students	Prospective	Social provisions scale and Sallis social support for exercise scale	Theory of planned behavior	Social support was superior to subjective norm in predicting exercise intention and behavior
Stahl et al., 2001	3,342 adults (18+ years) from 6 European countries	Cross-sectional	Questionnaire developed for study	N/A	Social support was significantly associated with physical activity

APPENDIX B: TESTS OF SELF-EFFICACY AND PERCEIVED BEHAVIORAL CONTROL IN THE TPB

Author(s)	Sample	Behavior	Design	Definition of SE / PBC	Finding
(McCaul et al., 1993)	138 (66 women & 72 men) undergraduate students	Detection of cancer	3 month prospective	Emphasised the perceived ability aspect of SE. SE and PBC were insufficiently defined (1 item)	Although both PBC and SE were significant, PBC had effects of stronger magnitude.
(McCaul et al., 1993)	81 (49 men & 32 women) undergraduate students (M=30 yrs.)	flossing and brushing	2 month prospective	Emphasised the perceived ability aspect of se, but used internal & external control items.	Although both PBC and SE were significant, PBC had effects of stronger magnitude.
(Terry & O'Leary, 1995)	146 males & females (50% of each; 20.2 yrs., SD=1.69).	Exercise	2 Weeks Prospective	PBC for control over external events and SE for ability appraisal	PBC was NS for intention but for significant for behavior. SE was significant for intention. PBC moderated behavior intention link and SE did not.
(Sparks et al., 1997)	91 adults (66 female & 25 male)	Consumption of red meat	Cross-Sectional	Easy/difficult for SE and control items for PBC	Control was not significant to intention while SE was.
(Sparks et al., 1997)	97 (43 female, 51 male) predominantly 15-16 year olds.	Consumption of french fries	Cross-Sectional	Easy/difficult for SE and control items for PBC	Control was not significant to intention while SE was.
(Manstead & Eekelen, 1998)	171 students (81 female & 90 Male) age 15	Academic behavior measured by grade	Prospective	1) SE: ability 2)PBC: belief	Best predictor of behavior was habit followed by SE

	average			that an outcome can be influenced by one's own effots	SE was more predictive of intention than PBC.
(Estabrooks & Carron, 1998)	Older adults 157 age m=68 sd=7.87	Exercise	3 Month Prospective	Barrier SE & Scheduling SE, and PBC	Scheduling SE was the most important predictor along with intention for behavior. Scheduling SE was also the most important predictor for intention.
(Armitage & Conner, 1999)	221 adults (mean age =23 yrs)	Low fat diet	Prospective	SE was defined as internal (one's own ability) while PBC was control over external factors.	Intention was sole predictor of behavior. All variables significantly predicted intention but attitude & SE were the best predictors.
(Armitage & Conner, 1999b)	334 female and 79 male hospital workers	Low fat diet	3 month prospective	SE was defined as internal (one's own ability) while PBC was control over external factors.	Intention was the best predictor of behavior, but self-efficacy was a significant predictor. Self-efficacy was the strongest predictor of intentions. PBC was either non-significant or significant due to a suppresor effect.
(Armitage et al., 1999)	176 undergraduate students	Alcohol and cannabis use	1 week prospective	SE was defined as internal (one's own ability) while PBC was control over external factors.	Intention was the best predictor of behavior, but self-efficacy was a significant predictor for cannabis. Self-efficacy was the strongest predictor of intentions. PBC was either non-significant or significant due to a suppresor effect.
Povey et al., 2000	287 males and females (16-81 years)	Dietary behavior	1 month prospective	SE was defined as internal (one's own ability) while PBC was control over external factors.	Intention was the best predictor of behavior, but self-efficacy was a significant predictor.

APPENDIX C: PERSONALITY MODELS AS DETERMINANTS OF EXERCISE

Researchers	Participants	Design	Measures	Findings
(Massie & Shephard, 1971)	Sedentary middle-aged buisinessmen aged 29-56 yrs.	7 months prospective	Muadsley Personality Inventory (E & N)	Groups were devided into adherers and dropouts; high E was significantly associated with drop-out
(Sharp & Reilley,)	65 male college students aged 18-23 participating in an aerobic conditioning class 2x weekly	Cross-sectional	MMPI	Fitness determined by physiological tests; results identify positive correlations of more favorable scales and negatively with less favorable scales
(Renfrow & Bolton, 1979)	23 male exercisers m age = 39.5 sd=7.5 and 23 nonexercisers m age = 46.1 sd=10.9	Cross-sectional	Cattell's 16 PF	sig. differences greater for non-exercisers: conscientious, outgoing, shrewd, (discreetness, & super-ego for larger domains); for exercisers: liberal, self-sufficient, (cortertia, & independence for larger domains)
(Blumenthal et al., 1982)	35 patients with myocardial infarction (32 men 3 women) m age = 53.7 yrs	1 yr. prospective 3-5xweek	MMPI	75%> attendence = compliers; sig. emotional distress for drop-outs; drop-outs were sig. on social introversion, anxiety, and lower on ego strength; ego strength and social introversion added to the prediction of compliance in discriminant analysis
(Howard et al., 1987)	185 middle-management executives m age=44 sd=9.8	5 yr prospective	Cattell 16PF	Used physiological tests for fitness; correlated positively with outgoing, venturesome, self-sufficient, relaxed, and E
(Hogan, 1989)	sample 1: 97 us navy enlistees m age = 22	Cross-sectional	HPI	Used physiological fitness measures; N (adjustment) was

	sample 2: 35 male police applicants m age = 25.8			sig negatively correlated; C (prudence) was sig correlated; ambition/activity aspect of E was correlated socciability was less so
(Schnurr et al., 1990)	156 males median =64	longitudinal study utilized data from 1938	psychiatrist interview of 25 aspects of personality	postitve current associations were with vitality (.17), integration (.24); negative associations were with sensitivity (.14), shyness (.13)
(Davis et al., 1991)	Sample 1: 103 male students m age = 26.61 sd = 3.65 Sample 2: 88 men from health clubs m age = 28.45 sd=11.58	Cross-sectional	EPI	Sig. diff between exercisers and college students in physical activity; E was not sig. between groups but N was sig. lower for exercisers
(Davis & Fox, 1993)	351 women from the university community divided into low, medium & high exercisers m age = 29	Cross-sectional	EPI	Low exercisers had significantly higher N and lower E than high exercisers
(Szabo, 1992)	21 exercisers (12 women & 9 men) m age =23.1 sd=4.9 & 14 non-exercisers (8 women & 6 men) m age =24.2 sd=6.4 from community center	Cross-sectional	EPI	E was higher for exercisers than non; N was higher for non-exercisers than exercisers
(Potgieter & Venter, 1995)	116 students and faculty joining an exercise facility (61 men and 55 women) m age =21.5 yrs	1 yr longitudinal	EPI	Classified as adherers vs drop-outs 1 yr later; means for E were not different; N was sig higher for drop-outs
(Siegler et al., 1997)	3630 men and 796 women in middle age	longitudinal since 1964 - 66	MMPI	depression, psychopathic deviance, and social introversion predicted low exercise independent of sex
(Yeung & Hemsley, 1997a)	46 females m age = 31.9 sd=7.5	8 week prospective	EPI	E was negatively associated with adherence
(Yeung & Hemsley, 1997b)	252 adults from community centers (204 women & 48 men) m age = 33 sd=10	Cross-sectional	EPI	E was not sig. but N correlated -.23 p<.001
(Arai & Hisamichi, 1998)	22,448 adults (40-64 years)	Cross-sectional	EPI	E was sig. Associated with exercise positively, while N and P were sig. Associated with

				exercise negatively
(Courneya & Hellsten, 1998)	264 undergrads m age = 21.3 sd=3 (62% female)	Cross-sectional	NEO-FFI	N sig. correlated negatively with exercise and adherence; E & C sig. correlated postively with exercise and adherence
(Courneya et al., 1999)	study 1: 300 female undergrads m age =19.6 sd=3.8 study 2: 67 females enroled in aerobics classes m age =25 sd=8	Study 1: Cross-sectional Study 2: 11 week prospective	NEO-FFI	N sig. correlated negatively with exercise or adherence; E & C sig. correlated postively with exercise or adherence; E explained sig. variance in exercise beyond the mediation of the TPB (study 1&2)
(Sale et al., 2000)	187 adults (mean age = 25)	Cross-sectional	EPI	E was sig. Associated with physical activity .19, while N was not sig.
(Rhodes et al., 2001b)	175 breast cancer survivors	Retrospective	NEO-FFI	E & C were sig. associated with later stages of exercise behavior change, while N was sig. Associated with earlier stages of exercise behavior change
(Rhodes et al., 2001c)	422 female undergraduate students	Prospective	NEO-FFI	E was associated with exercise behavior while controlling for the theory of planned behavior.

APPENDIX D: NOTICE OF RESEARCH STUDY

My name is Dr. Kerry Courneya and I am an associate professor in the Department of Oncology at the University of Alberta. I am also a member of the Scientific Staff of the Cross Cancer Institute (Edmonton). As part of my responsibilities, I conduct research in the area of exercise and cancer. I have contacted you because you are eligible to participate in one of my current projects on exercise and cancer survivors and I would like to invite you to do so. My co-investigator on the project is Mr. Ryan Rhodes who is one of my current graduate students. The study has been reviewed by the Alberta Cancer Board's Research Ethics Committee and has met the rigorous requirements for ethical approval. Please be assured that your name and any personal information has not and will not be released to anyone other than myself and Mr. Rhodes and we will hold this information in strict confidence.

In our previous research we have found that exercise may be beneficial to the physical fitness and quality of life of cancer survivors. However, we have also found that many cancer survivors have difficulty maintaining a regular exercise program once their treatments are completed. In this study, we are trying to look at the exercise patterns of cancer survivors and some of the factors that influence these patterns. This information will be very helpful to us in designing specific motivational/informational materials for cancer survivors interested in exercise. We hope that you will help us out by participating in the study

What do I have to do to participate?
It is actually quite simple. All we ask is that you complete the enclosed questionnaire and return it to us at your earliest convenience. That's it! This entire questionnaire should take less than 45 minutes of your time. **You may refuse to answer any questions in the questionnaire.** We have provided a self-addressed, stamped envelope for your convenience and instructions are provided on the front of the questionnaire.

But I don't exercise and so I won't be of any help!
Yes you will! It is only by understanding the issues of **both** exercisers and non-exercisers that we can hope to gain a fuller understanding of all that is involved in the decision of whether or not to exercise following cancer treatment.

Do I have to participate?
Absolutely not! **Your participation is completely voluntary**. If you choose not to participate please disregard this, or any future information you may receive about our study. However, it is only through voluntary participation in research projects that we increase our knowledge about issues that are important to cancer survivors. We hope you can find the time to help us out. If you have any questions about the study or about completing the questionnaire, please feel free to call us collect at the numbers provided below.

Sincerely,

Kerry Courneya, Ph.D.
Associate Professor,
Department of Oncology, Cross Cancer Institute; University of Alberta
Tel: (780) 492 – 1031, E-mail: kerry.courneya@ualberta.ca

Ryan Rhodes, M.A., Graduate Student
Faculty of Physical Education, University of Alberta
Tel: (780) 492 – 2829, E-mail: rrhodes@ualberta.ca

APPENDIX E: INFORMED CONSENT

This consent form is part of the process of informed consent. It is designed to give you an idea of what this research study is about and what will happen to you if you choose to be in the study. Read this form carefully to make sure you understand all the information it provides. You will get a copy of this form to keep. This study may not help you directly, but we hope that it will teach us something that will help others in the future.

Background Information

Evidence has shown that physical exercise is an advantageous complementary form of therapy to pursue for cancer survivors. However, understanding the factors that determine the descision whether to exercise or not helps design the most effective exercise programs.

Purpose

We will be asking you questions addressing your personality, feelings about, and your participation in, physical exercise. This provides us a more complete understanding of exercise behavior in cancer survivors. Further, this assists us in creating specific motivational and informational materials which are utilized by those who choose to exercise after their cancer experience, but are having trouble getting started, or in keeping going.

Description of the Study

Your participation in the study involves the completion of the enclosed questionnaire. Specifically, the questionnaire covers information concerning personal characteristics, exercise beliefs and attitudes, as well as current and past exercise habits. This questionnaire, as attached, should take about 45 minutes to complete. If any question asks for information that you are not comfortable in providing, you are not required to do so - just leave it blank and move on to the next question. There is no follow-up or requirement to exercise.

Risk and Benefits of Study Participation

Some possible risk is involved if you choose to participate in this study. We will be asking you to recall your cancer experience, which for some may be traumatic. If this is problematic for you, you need not participate. If you would like someone to speak to about your cancer experience, you may contact the Department of Psychology at the Cross Cancer Institute (780) 432- 8703, or the Department of Psychosocial Resources at the Tom Baker Cancer Centre (403) 670-1767. Also, it is not expected that there will be any personal benefit to you. However, your participation may help improve patient care in the long term.

Participant's Initials _____ Date:

Consent Version
Date: June 24/99

Confidentiality

The information that we collect as part of this study will be shared with other researchers and doctors. However, you will not be identified in any of these reports. Strict confidentiality will be maintained and you will not be identified by name on any of the data and materials submitted.

We will keep all the material we collect for this study in a safe storage area. In the future, other researchers may want to use this material for new studies. Although we will not contact you if this happens, each new study will be reviewed to make sure that it is ethical. Each person looking at your records will follow the relevant Alberta Cancer Board policies and procedures that control these actions.

Understanding of Participants

I am signing this form to show that I have read the consent form and that I have understood to my satisfaction the information regarding my participation in this study. Further, I agree to participate in this study. In no way does this waive my legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. I am free to withdraw from the study without jeopardizing my health care. If I have further questions concerning this research study, I may call the research coordinators at:

Kerry Courneya, Ph.D., University of Alberta: (780) 492-1031
Ryan Rhodes, M.A., University of Alberta: (780) 492-2829

If I have any questions concerning my rights as a possible participant in this research, I may contact the Patient Advocate (780) 492 - 8585. I will get to keep a copy of this consent for information and for future reference.

(PRINT NAMES CLEARLY)

_____	_____
Name of Participant	Signature of Participant
_____	_____
Name of Witness	Signature of Witness
_____	_____
Name of Principal Investigator	Signature of Principal Investigator

_____
Date

APPENDIX F: EXERCISE ATTITUDE QUESTIONNAIRE

The following questions ask you to rate how you feel about exercising regularly. Exercise is defined here as any activity performed on a repeated basis over an extended period of time with the intention of improving physical fitness and health. Some examples of exercises include jogging, aerobics, weight training, and sports. Regular exercise is defined as exercise done at least 3 times per week, for at least 30 minutes in duration, and at least at a moderate intensity (i.e., light perspiration). Pay careful attention to the words at each end of the scales and circle the number that best represents how you feel about exercising regularly over the next 2 weeks.

For me, exercising regularly is:

1	2	3	4	5	6	7
extremely enjoyable	quite enjoyable	slightly enjoyable		slightly unenjoyable	quite unenjoyable	extremely unenjoyable
1	2	3	4	5	6	7
extremely useful	quite useful	slightly useful		slightly useless	quite useless	extremely useless
1	2	3	4	5	6	7
extremely wise	quite wise	slightly wise		slightly foolish	quite foolish	extremely foolish
1	2	3	4	5	6	7
extremely boring	quite boring	slightly boring		slightly interesting	quite interesting	extremely interesting
1	2	3	4	5	6	7
extremely relaxing	quite relaxing	slightly relaxing		slightly stressful	quite stressful	extremely stressful
1	2	3	4	5	6	7
extremely harmful	quite harmful	slightly harmful		slightly beneficial	quite beneficial	extremely beneficial

APPENDIX G: EXERCISE INJUNCTIVE NORM

The next set of questions ask you about what other people in your social network (e.g., friends, family, co-workers) think about you exercising. Please respond to each statement using the following scale by circling a number between 1 and 7 at the end of each statement. Please answer these questions thinking only about the people in your social network.

1 strongly disagree	2 moderately disagree	3 slightly disagree	4	5 slightly agree	6 moderately agree	7 strongly agree

1. Most people in my social network want me to exercise over the next 2 weeks.	1	2	3	4	5	6	7
2. Most people in my social network would approve if I exercised over the next 2 weeks.	1	2	3	4	5	6	7

APPENDIX H: DESCRIPTIVE NORM

5. Most of my friends will exercise regularly over the next two weeks.	1	2	3	4	5	6	7
6. Most of my family members will exercise regularly over the next 2 weeks.	1	2	3	4	5	6	7
7. Most of my co-workers exercise regularly over the next 2 weeks.	1	2	3	4	5	6	7

APPENDIX I: SOCIAL SUPPORT FOR EXERCISE QUESTIONNAIRE

These questions ask you if people in your social network (e.g., friends, family, co-workers) provide you with exercise support. Exercise support refers to the assistance, aid, or help that your social network provides to improve your ability to exercise regularly (e.g., someone to exercise with, or who offers to exercise with you; someone who offers to take over chores so you have more time to exercise; someone who reminds you to exercise, etc.). Please read and give an answer to every question.

Regular exercise is defined as exercise done at least 3 times per week, for at least 20 minutes in duration, and at least at a moderate intensity (i.e., light perspiration).

1 strongly disagree	2 moderately disagree	3 slightly disagree	4	5 slightly agree	6 moderately agree	7 strongly agree

1.	People in my social network are likely to help me exercise regularly over the next 2 weeks.	1	2	3	4	5	6	7
2.	There is no one in my social network that I can turn to for assistance with regular exercise over the next 2 weeks.	1	2	3	4	5	6	7
3.	I feel that someone in my social network will provide the support I need in order to exercise regularly over the next 2 weeks.	1	2	3	4	5	6	7

APPENDIX J: SELF-EFFICACY

1. I believe I have the ability to regularly exercise in the next 2 weeks.

1	2	3	4	5	6	7
Definitely Do not	Moderately Do not	Slightly Do not		Slightly Do	Moderately Do	Definitely Do

2. How confident are you that you will be able to exercise regularly in the next 2 weeks?

1	2	3	4	5	6	7
Very Unconfident	Moderately Unconfident	Slightly Unconfident		Slightly Confident	Moderately Confident	Very onfident

3. How confident are you that you could overcome obstacles that prevent you from exercising regularly over the next 2 weeks?

1	2	3	4	5	6	7
Very Unconfident	Moderately Unconfident	Slightly Unconfident		Slightly Confident	Moderately Confident	Very Confident

APPENDIX K: PERCEIVED VOLITIONAL CONTROL

4. Whether or not I exercise regularly in the next 2 weeks is entirely up to me.

1	2	3	4	5	6	7
Strongly Disagree	Moderately Disagree	Slightly Disagree		Slightly Agree	moderately Agree	strongly Agree

5. How much personal control do you feel you have over exercising regularly in the next 2 weeks?

1	2	3	4	5	6	7
Very Little Control	Moderately Little Control	Slightly little Control		Slight Control	Moderate Control	Complete Control

6. How much do you feel that exercising regularly in the next 2 weeks is beyond your control?

1	2	3	4	5	6	7
Not at All	Moderately Not	Slightly Not		Slightly	Moderately	Very Much

APPENDIX L: EXERCISE INTENTION SCALE

The following questions ask you about your intentions to exercise for the next 2 weeks. Please focus on what your current plans or goals are for exercise rather than what you think will actually happen.

1. In the next two weeks, my goal is to exercise:

1	2	3	4	5	6	7
Not at all		once in a while		every other day		every day

2. Over the next 2 weeks, I intend to exercise at least _____ times per week. (Please use a number between 0 and 7).

APPENDIX M: EXERCISE BEHAVIOR QUESTIONNAIRE

For this next question, we would like you to recall your average weekly exercise over the past 2 weeks. How many times per week on average did you do the following kinds of exercise over the past month?

When answering these questions please:

< consider your average weekly exercise over the past 2 weeks.

< only count exercise that was done during free time (i.e., not occupation or housework).

< note that the main difference between the three categories is the intensity of the exercise.

< please write the average frequency on the first line and the average duration on the second line.

	Times Per Week	Average Duration
a. STRENUOUS EXERCISE (HEART BEATS RAPIDLY, SWEATING) (e.g., running, jogging, hockey, soccer, squash, cross country skiing, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes, heavy weight training)	_____	_____
b. MODERATE EXERCISE (NOT EXHAUSTING, LIGHT PERSPIRATION) (e.g., fast walking, baseball, tennis, easy bicycling, volleyball badminton, easy swimming, alpine skiing, popular and folk dancing)	_____	_____
c. MILD EXERCISE (MINIMAL EFFORT, NO PERSPIRATION) (e.g., easy walking, yoga, bowling)	_____	_____

APPENDIX N: FIVE-FACTOR INVENTORY (NEO FFI)

Below is a list of statements that describe people. Please rate the extent to which each of these statements describes you. There are no right or wrong answers and all that is required is that you provide honest responses. Do not spend too long on any one statement but rather go with your first impression. Please use the following scale to guide your responses.

0 strongly disagree	1 disagree	2 neutral	3 agree	4 strongly agree

1. I am not a worrier.	0	1	2	3	4
2. I like to have a lot of people around me.	0	1	2	3	4
3. I don't like to waste my time daydreaming.	0	1	2	3	4
4. I try to be courteous to everyone I meet.	0	1	2	3	4
5. I keep my belongings clean and neat.	0	1	2	3	4
6. I often feel inferior to others.	0	1	2	3	4
7. I laugh easily.	0	1	2	3	4
8. Once I find the right way to do something, I stick to it.	0	1	2	3	4
9. I often get into arguments with my family and coworkers.	0	1	2	3	4
10. I'm pretty good about pacing myself so as to get things done on time.	0	1	2	3	4
11. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.	0	1	2	3	4
12. I don't consider myself especially light-hearted.	0	1	2	3	4
13. I am intrigued by the patterns I find in art and nature.	0	1	2	3	4
14. Some people think I'm selfish and egotistical.	0	1	2	3	4
15. I am not a very methodical person.	0	1	2	3	4
16. I rarely feel lonely or blue.	0	1	2	3	4
17. I really enjoy talking to people.	0	1	2	3	4
18. I believe that letting students hear controversial speakers can only confuse and mislead them.	0	1	2	3	4
19. I would rather cooperate with others than compete with them.	0	1	2	3	4

	0 strongly disagree	1 disagree	2 neutral	3 agree	4 strongly agree
20. I try to perform all the tasks assigned to me conscientiously.	0	1	2	3	4
21. I often feel tense and jittery.	0	1	2	3	4
22. I like to be where the action is.	0	1	2	3	4
23. Poetry has little or no effect on me.	0	1	2	3	4
24. I tend to be cynical and skeptical of others' intentions.	0	1	2	3	4
25. I have a clear set of goals and work toward them in an orderly fashion.	0	1	2	3	4
26. Sometimes I feel completely worthless.	0	1	2	3	4
27. I usually prefer to do things alone.	0	1	2	3	4
28. I often try new and foreign foods.	0	1	2	3	4
29. I believe that most people will take advantage of you if you let them.	0	1	2	3	4
30. I waste a lot of time before settling down to work.	0	1	2	3	4
31. I rarely feel fearful or anxious.	0	1	2	3	4
32. I often feel as if I'm bursting with energy.	0	1	2	3	4
33. I seldom notice the moods or feelings that different environments produce.	0	1	2	3	4
34. Most people I know like me.	0	1	2	3	4
35. I work hard to accomplish my goals.	0	1	2	3	4
36. I often get angry at the way people treat me.	0	1	2	3	4
37. I am a cheerful, high-spirited person.	0	1	2	3	4
38. I believe we should look to our religious authorities for decisions on moral issues.	0	1	2	3	4
39. Some people think of me as cold and calculating.	0	1	2	3	4
40. When I make a commitment, I can always be counted on to follow through.	0	1	2	3	4

	0 strongly disagree	1 disagree	2 neutral	3 agree	4 strongly agree
41. Too often, when things go wrong, I get discouraged and feel like giving up.	0	1	2	3	4
42. I am not a cheerful optimist.	0	1	2	3	4
43. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.	0	1	2	3	4
44. I'm hard-headed and tough-minded in my attitudes.	0	1	2	3	4
45. Sometimes I'm not as dependable or reliable as I should be.	0	1	2	3	4
46. I am seldom sad or depressed.	0	1	2	3	4
47. My life is fast-paced.	0	1	2	3	4
48. I have little interest in speculating on the nature of the universe or the human condition.	0	1	2	3	4
49. I generally try to be thoughtful and considerate.	0	1	2	3	4
50. I am a productive person who always gets the job done.	0	1	2	3	4
51. I often feel helpless and want someone else to solve my problems.	0	1	2	3	4
52. I am a very active person.	0	1	2	3	4
53. I have a lot of intellectual curiosity.	0	1	2	3	4
54. If I don't like people, I let them know it.	0	1	2	3	4
55. I never seem to be able to get organized.	0	1	2	3	4
56. At times I have been so ashamed I just wanted to hide.	0	1	2	3	4
57. I would rather go my own way than be a leader of others.	0	1	2	3	4
58. I often enjoy playing with theories or abstract ideas.	0	1	2	3	4
59. If necessary, I am willing to manipulate people to get what I want.	0	1	2	3	4
60. I strive for excellence in everything I do.	0	1	2	3	4

APPENDIX O: DEMOGRAPHIC MEDICAL QUESTIONNAIRE

This part of the questionnaire is needed to help understand the characteristics of the people participating in this study and is very important information. All information received is held in strict confidence and its presentation to the public will be group data only. If you do not know the answer to any question, or you do not wish to answer it, simply leave it blank and move to the next question. Please answer the following to the best of your knowledge.

I. Demographic Information

1. Age: _____

2. Sex: Male _____ Female _____

3. Marital Status: Never Married _____ Married _____ Common Law _____
Separated _____ Widowed _____ Divorced _____

4. Education: Some High School _____ Completed High School _____
Some University/College _____ Completed University/College _____
Some Graduate School _____ Completed Graduate School _____

5. Annual Family Income: < $20,000 _____ $20,000-39,999 _____ $40,000-59,000 _____
$60,000-79,999 _____ $80,000-99,999 _____ >$100,000 _____

6. Employment Status: Homemaker _____ Retired _____ Part-Time _____
Full-Time _____ Temporarily Unemployed _____

7. Height and Weight Infonnation: Weight in pounds _____ or kilograms. _____
Height in feet/inches _____ or meters/cent. _____

This part of the questionnaire is needed to help understand the medical characteristics of the people participating in the study. All information is held in strict confidence and its presentation to the the public will be in group data only. If you feel uncomfortable answering any of the questions, please feel free to leave them blank. Also, you may not know the answers to some of the medical questions, if you do not just circle DK (Don't Know). Please answer the following to the best of your knowledge.

II. Medical Information

8. Cancer Type (e.g., lung, colon): _____

9. Month and year of your diagnosis: Month _____ /Year_____
DK

10. "Stage" of your cancer (i.e., I, II, III, or IV):_____

11. Did you receive surgery (please circle)? Yes No

12. Type of surgery you had (e.g., lumpectomy):_____

13. Did you receive chemotherapy (please circle)? Yes No

How long did you receive chemotherapy for (number of months)?_____

14. Did you receive radiation therapy (please circle)? Yes No

How long did you receive radiation therapy for (number of months)? _____

15. Did you receive any other treatments? Please explain.

_____

_____

_____

_____